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AID Report 62-198 8 January 1963

SOVIET LITERATURE ON PROTECTIVE STRUCTURES AND COMPONENTS

AID Work Assigment No. 13

Report 6

Aerospace Information Division

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SUBJECT: Quarterly Report - AID Work Assignment No. 13

PERIOD : 17 July 1962 to 28 September 1962

This is the sixth of a series of reports reviewing Soviet literature on ground support equipment. This report is based on materials received at the Aerospace Information Division prior to 28 September 1962. The section on climatology is based on climatological studies of the Soviet Union prepared by the German military establishment during World War II. Report 6 deals with the following topics:

IV. Transport
- B1 Road-- Construction
- B3 Road-- March Order
- C Rail-- March Order

V. Launch Site
- E6 Accessories-- Gantries

VII. Natural Environmental Conditions
- General Climatic Data
  - USSR (Europe)
    - Snow Cover
    - Ice
  - Kazakh SSR
    - "Melkosopochnik" Region
    - Dzhezkazgan--Ulutau Region
    - Karsakpay--Baykonur Region

A list of the references cited accompanies the text. Library of Congress call numbers or Weather Bureau file numbers or call numbers are included at the end of the source entry when the source is available in the collections of the Library of Congress (LC) or the library of the U. S. Weather Bureau (WB).

SUBJECT: Quarterly Report - AID Work Assigment No. 13

PERIOD : 17 July 1962 to 28 September 1962

TOPIC IV. TRANSPORT

B1 Road-- Construction

Polyakov, Ye. A. Joint choice of road and automobile types for intraregional transport in the northeastern USSR. Avtomobil'nyye dorogi, no. 6, 1962, 19-20.

A considerable change has taken place during recent years in the design and mode of operation and in the load carrying capacities of automobiles. The roads constructed during the twenties are obsolete, and the construction of new roads has too often been carried out using old methods. The present article attempts to show the disparity between automobile and road in the light of current and future propects for the northeastern USSR, and specifically for the Magadanskaya oblast'. The automobiles considered were the ГАЗ-51, ЗИЛ-150, МАЗ-200, and ЯАЗ-210 tractor-trailer combinations with 4, 7, 12, and 20 ton capacities respectively, operating at speeds of 22, 27, and 35 km/hr.

Three types of roads were considered in calculating the best combination of trucks and speeds. Class III roads, for speeds up to 22 km/hr, feature a raised roadbed 6.5 m wide with gravel or dirt surface. Class II roads, for speeds up to 27 km/hr, have a roadbed 8 m wide and a 4-m wide throughway, with a two-layer (12 and 20 cm) gravel surface. Class I roads, for speeds up to 30 km/hr, feature a roadbed 10 m wide and a 6.5-m wide throughway, with a two-layer (12 and 26 cm) gravel surface. The top 8 cm of the upper layer of gravel is saturated with a binder.

The road building program in the Magadarskaya oblast' began in 1932. At that time, the basic vehicle in use was the AMO truck, with a 1.5-ton capacity. Today, with a traffic density many times heavier than in 1932 and with large tractor-trailers such as the ЯАЗ and the Tatra on the road, this road system is totally inadequate as to widths, grades, surfacing, and other features. The study concludes that with use of currently available roads, transportation costs are doubled and the maximum practically feasible speed is limited to 22 km/hr. It also recommends that only Class I roads be used under ordinary circumstances, and that only Class II roads be used even in exceptional cases.

B3 Road-- March Order

Gal'perin, A., V. Nikolenko, and I. Makarov. Automobile transport in sandy desert terrain. Avtomobil'nyy transport, no. 5, 1962, 24-26.

Construction of the 2163-km Bukhara--Urals gas trunk pipeline required the movement of a considerable volume of freight, including 24 to 26-m pipe sections, insulating materials, water, and heavy equipment, across both the Kyzyl-Kum and Kara-Kum deserts. The principal roads in these sandy deserts consisted of dirt roads, whose ruts were filled with fine dust. Roads traversing takyr* areas were passable only during the dry season of the year, while roads across areas of shifting sands were passable both in the spring and after the rains.

In order to select the most effective tractor-trailer combination for work under desert conditions, the automobile commission of Glavgaz SSSR, in cooperation with various interested organizations, conducted a series of tests on the МАЗ-501, МАЗ-502, КрАЗ-214, ЗИЛ-157, and ЗИЛ-164 trucks. The tests included the pulling of special trailers loaded with long sections of 1020-mm diameter pipe. The trucks were equipped first with conventional-tread tires, and then with special sand-tread tires. The tests showed that optimum results were obtained by the ЗИЛ-157 truck with standard-tread tires, pulling a telescopic trailer with special sand-tread tires of the Я-173 type. This combination was able to carry 7 tons of pipe at 45 to 46 km/hr on the road, and at 14 to 16 km/hr on nonshifting sand. The minimum speed registered was 6 to 8 km/hr.

B3 Road-- Network

Russia (USSR). Glavnoye upravleniye geodezii i kartografii. Atlas avtomobil'nykh dorog SSSR (Automobile road atlas of the USSR). 7th ed. Moskva, 1961. 32-35, 42-43, 108-111, 114-115.

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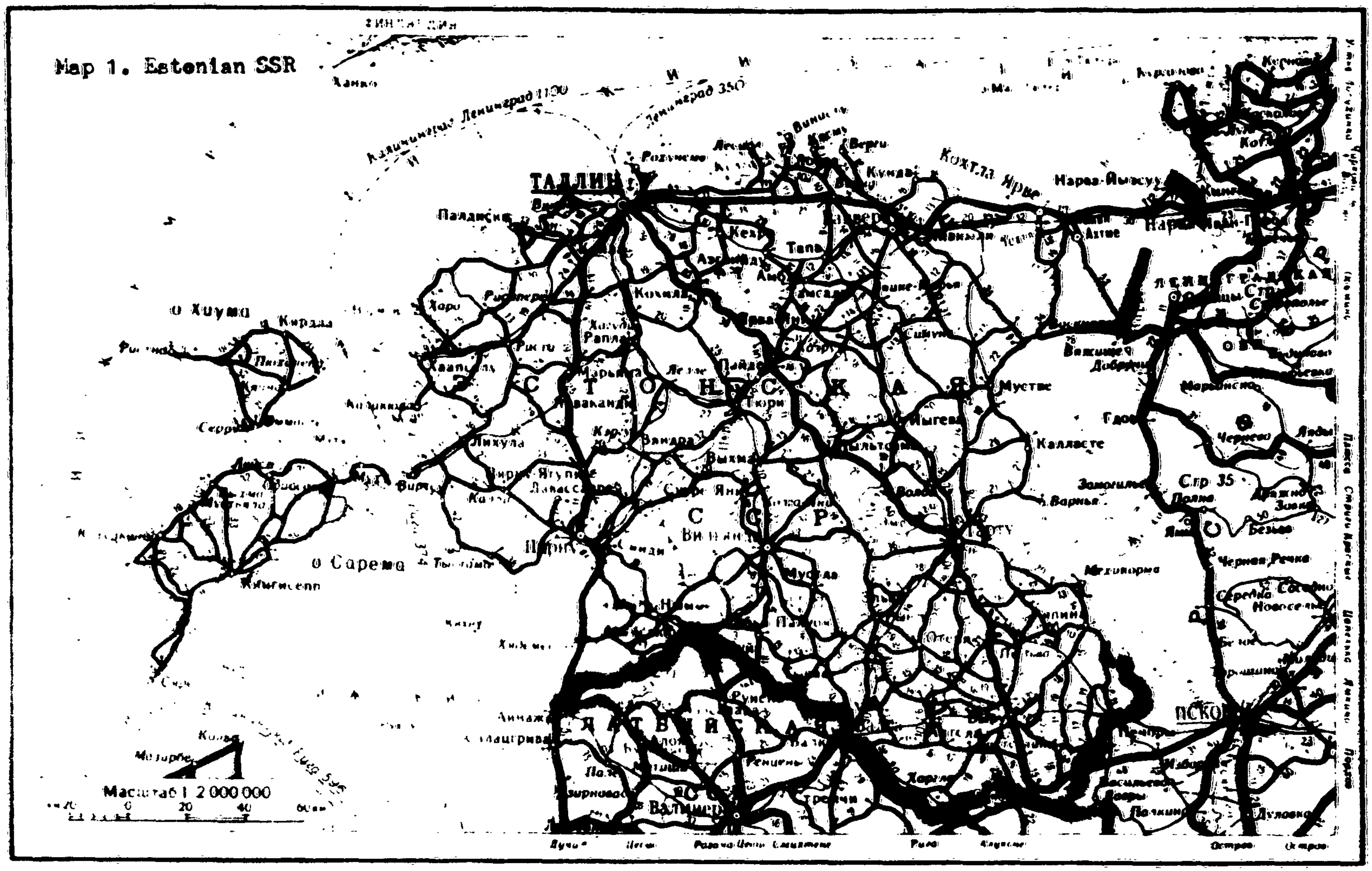
Estonian SSR [p. 33 of reference cited]	Map 1
Latvian SSR [p. 33]	Map 2
RSFSR. Leningradskaya oblast' [p. 34]	Map 3
RSFSR. Pskovskaya oblast' [p. 35]	Map 4

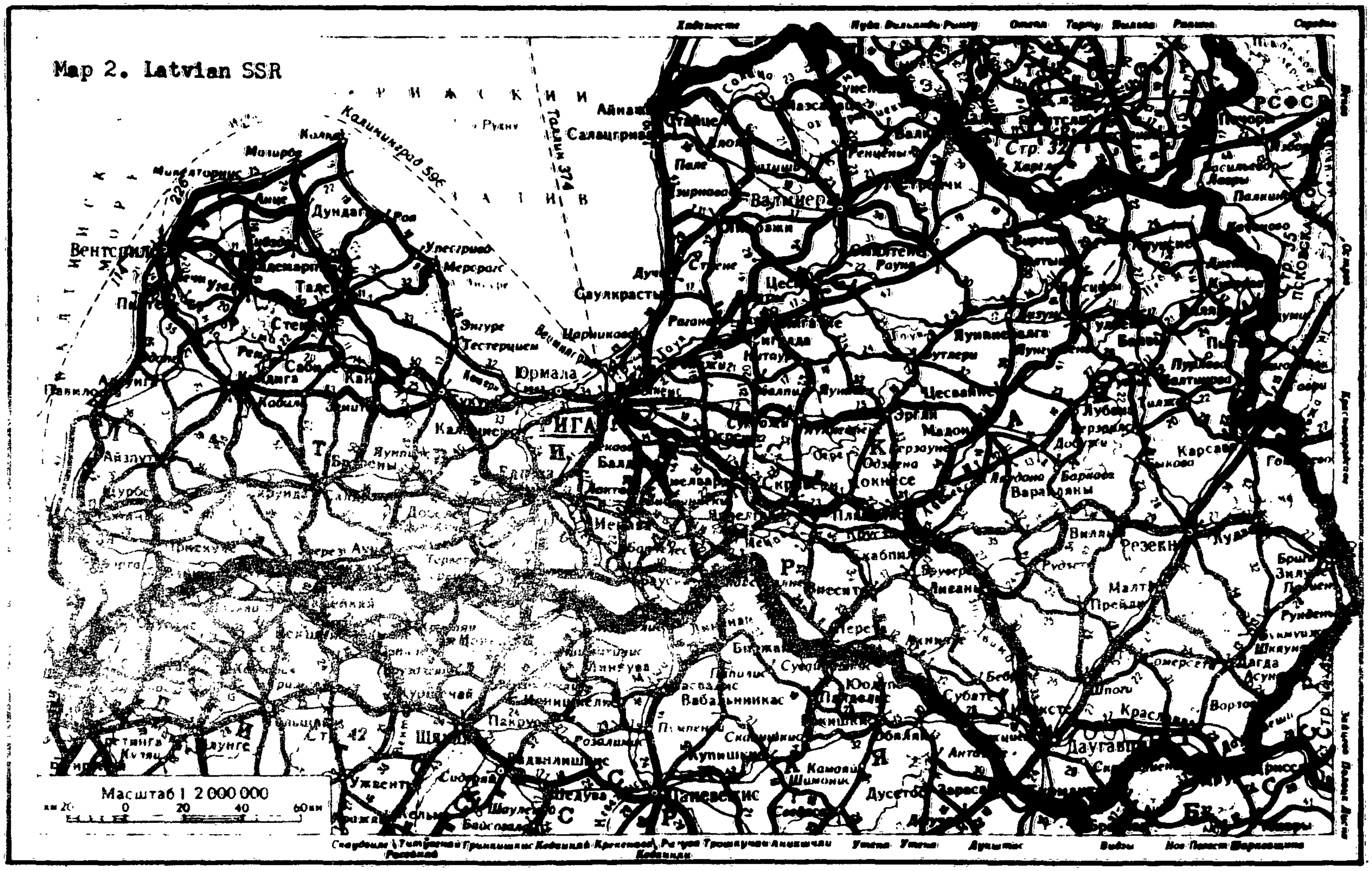
* "In Turkestan, a clayey tract amid sand." --Webster's New International Dictionary, 2d ed., unabridged. G. C. Merriam Co., 1939.

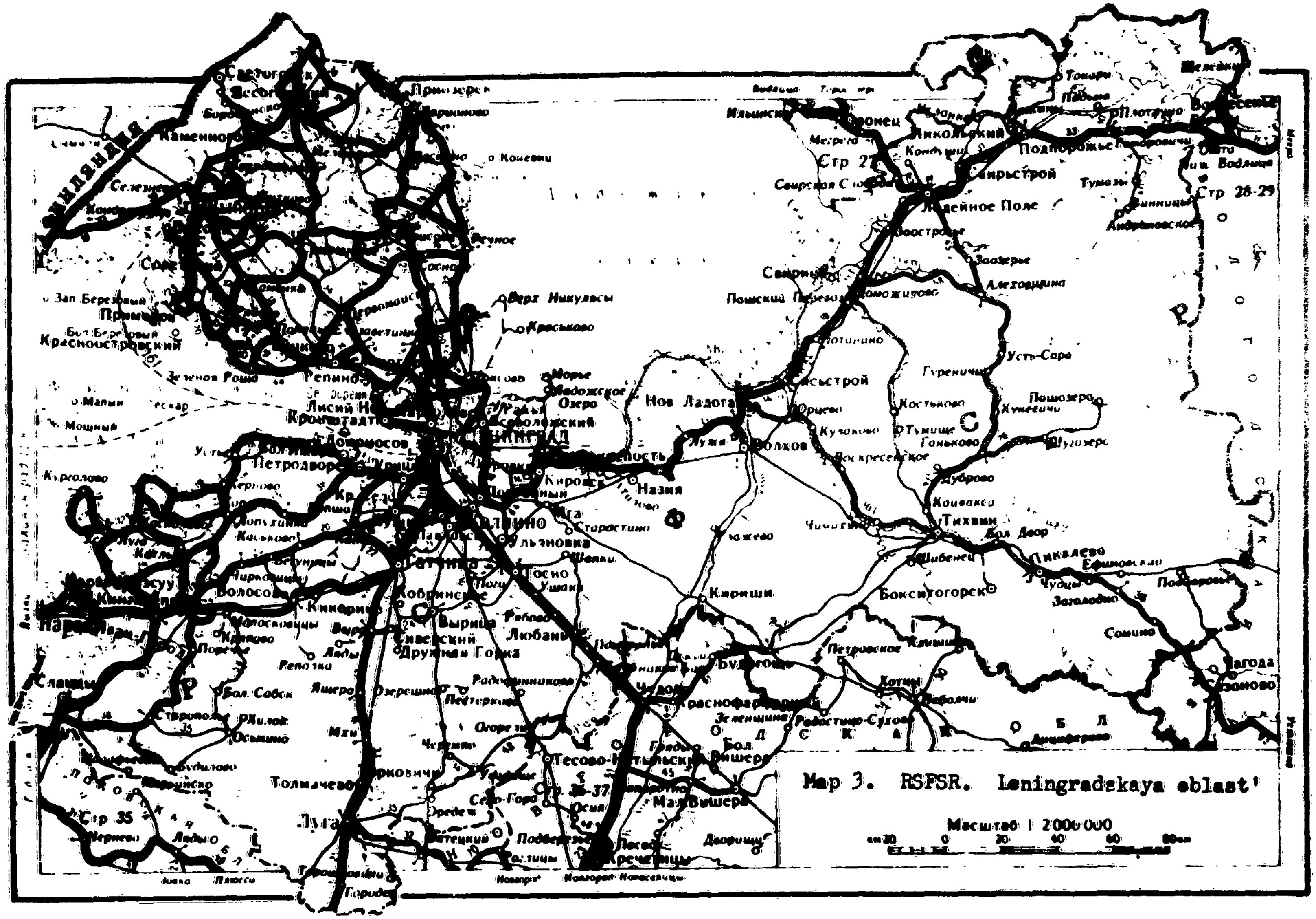
[Text resumes on p. 16.]

Map 1. Estonian SSR



Map 2. Latvian SSR





Map 3. RSFSR. Leningradskaya oblast'

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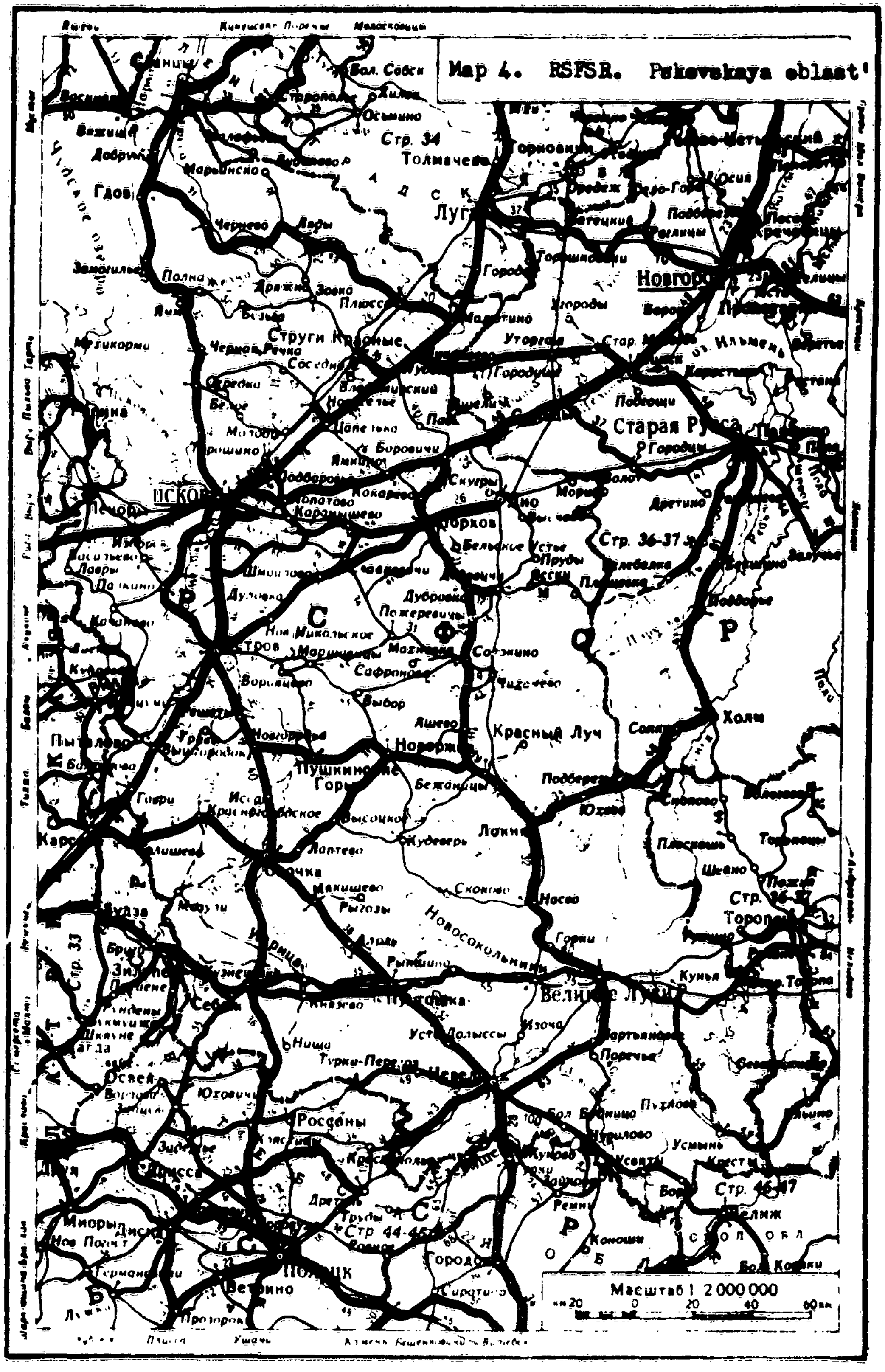
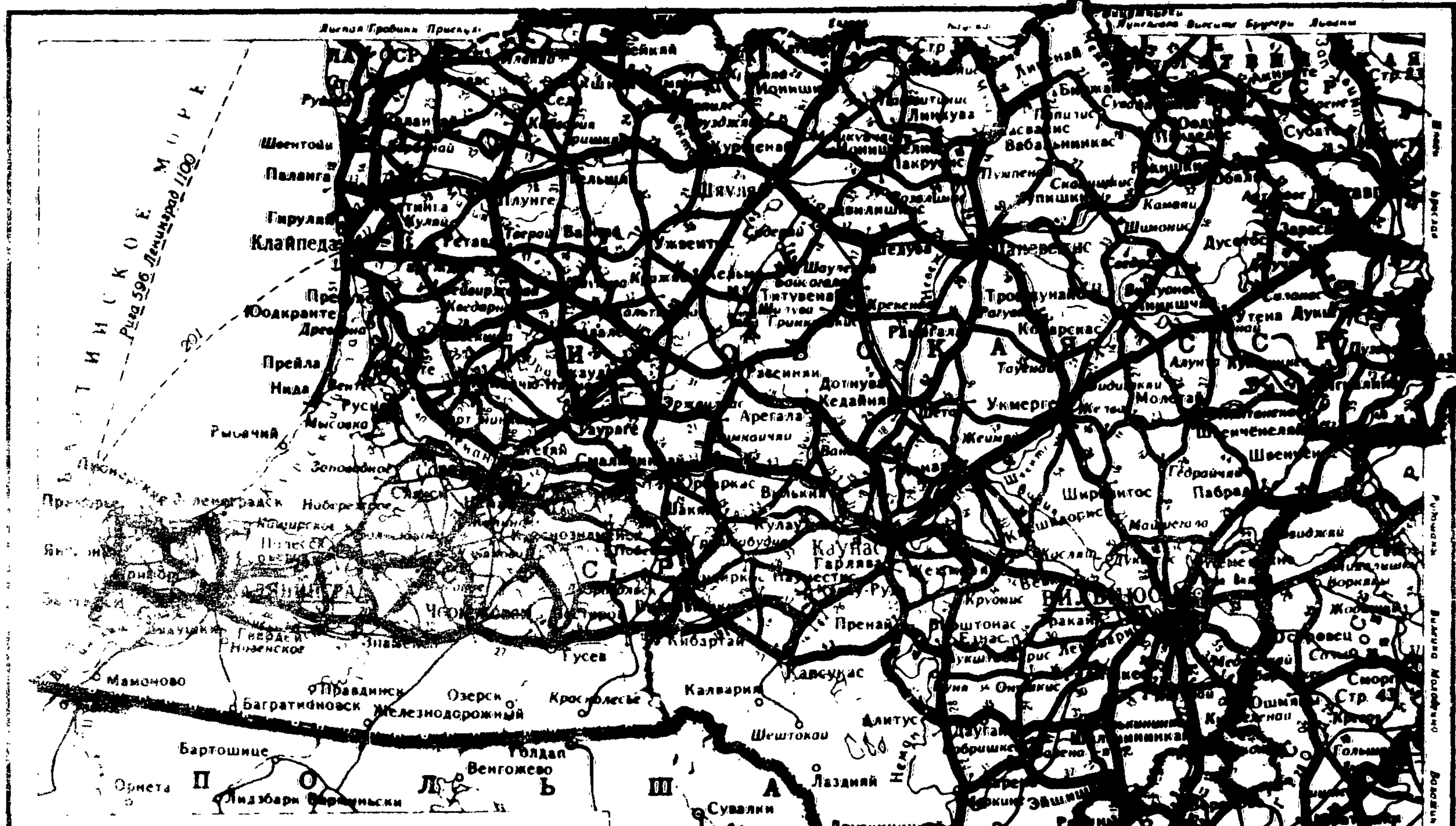
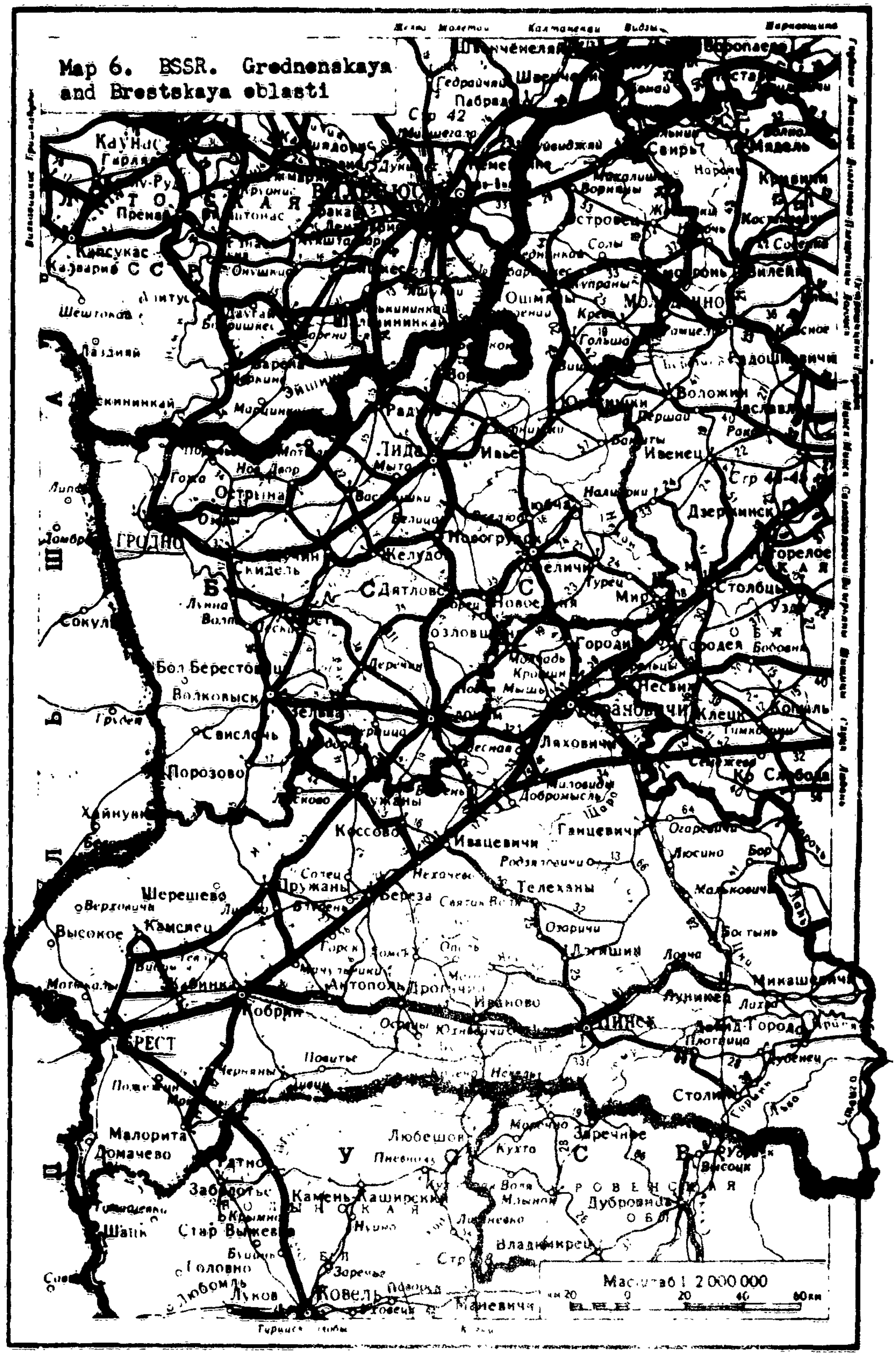
Map 4. RSFSR. Pskovskaya oblast'

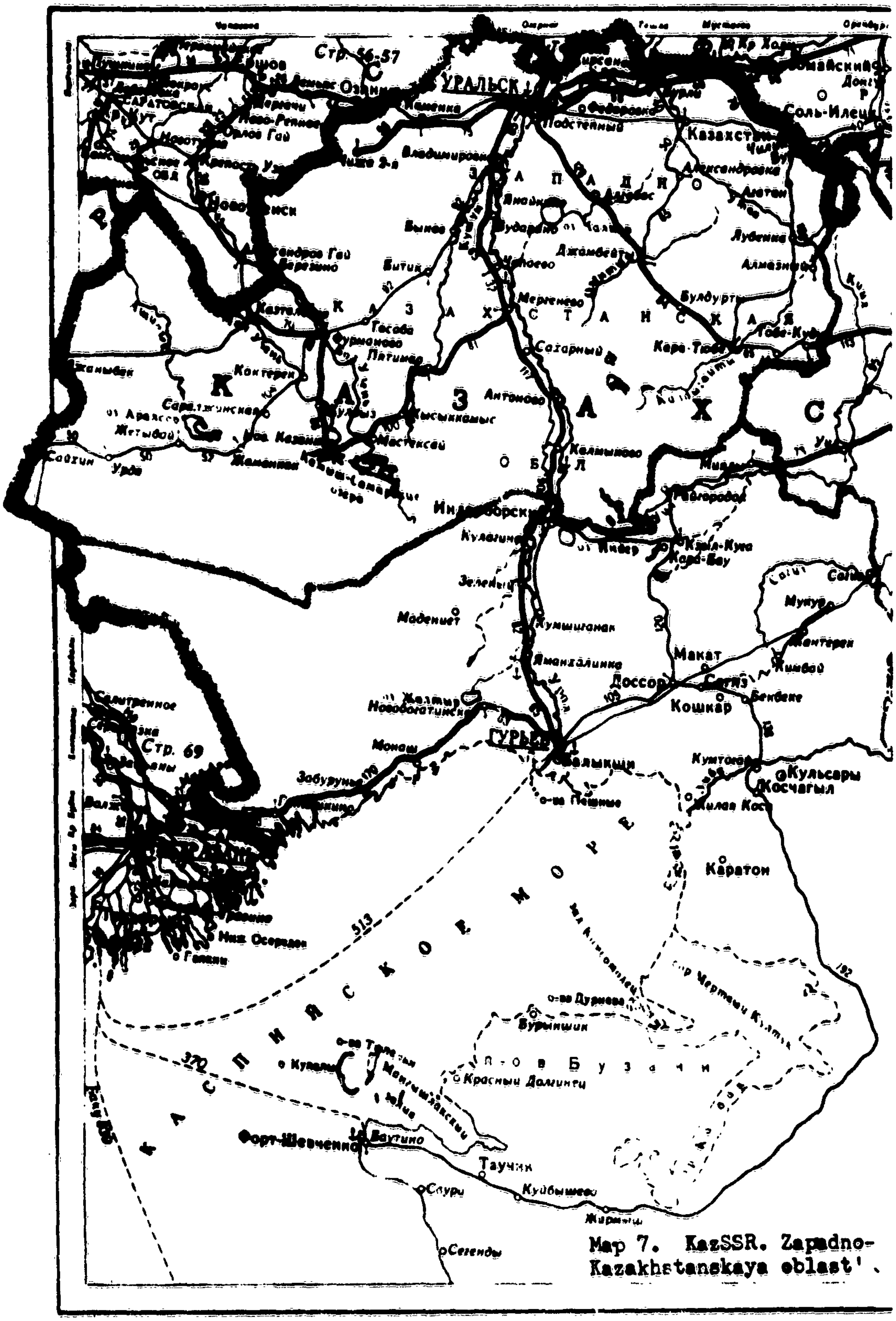




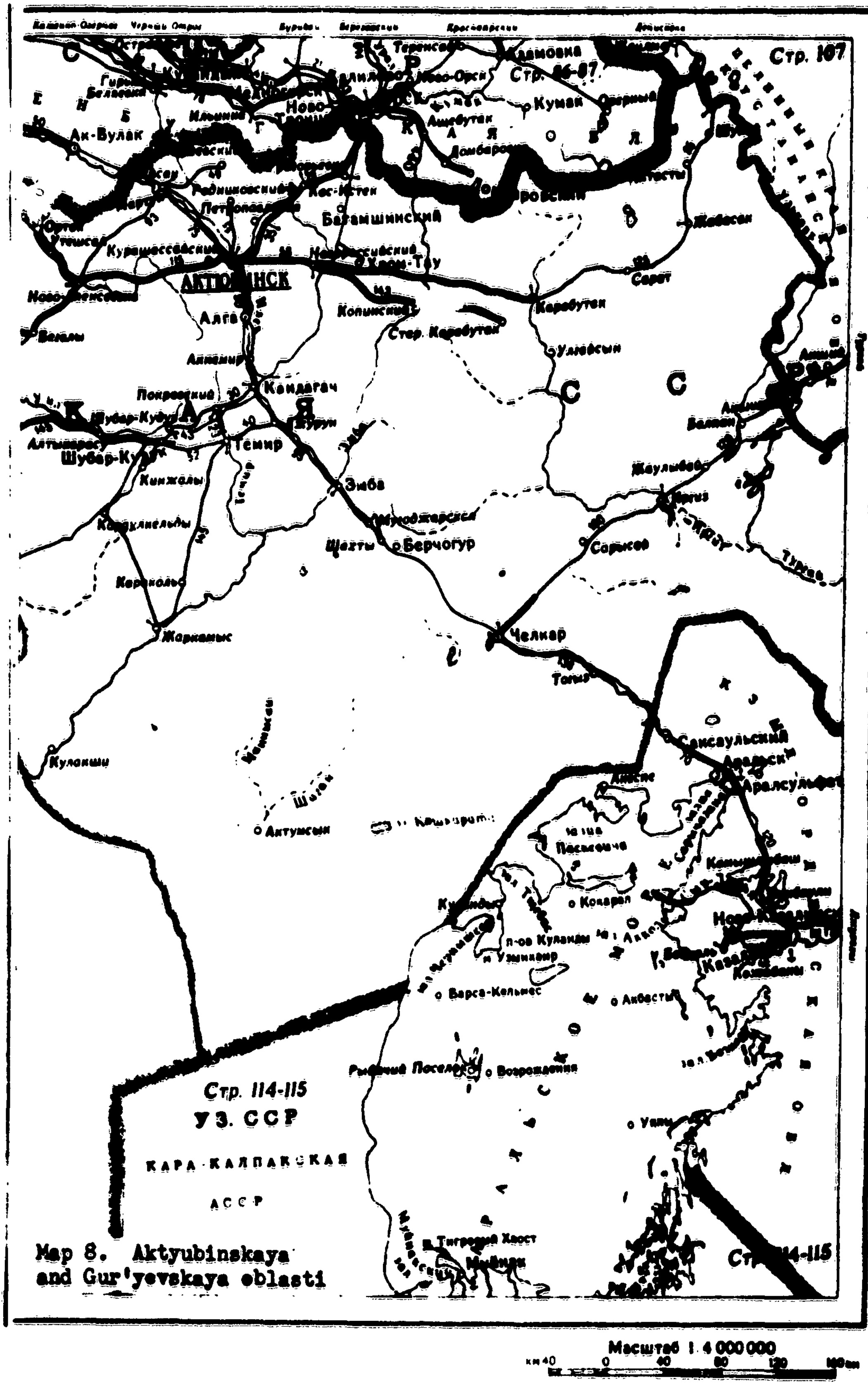
Map 5. Lithuanian SSR,
Kaliningradskaya oblast' (RSFSR)



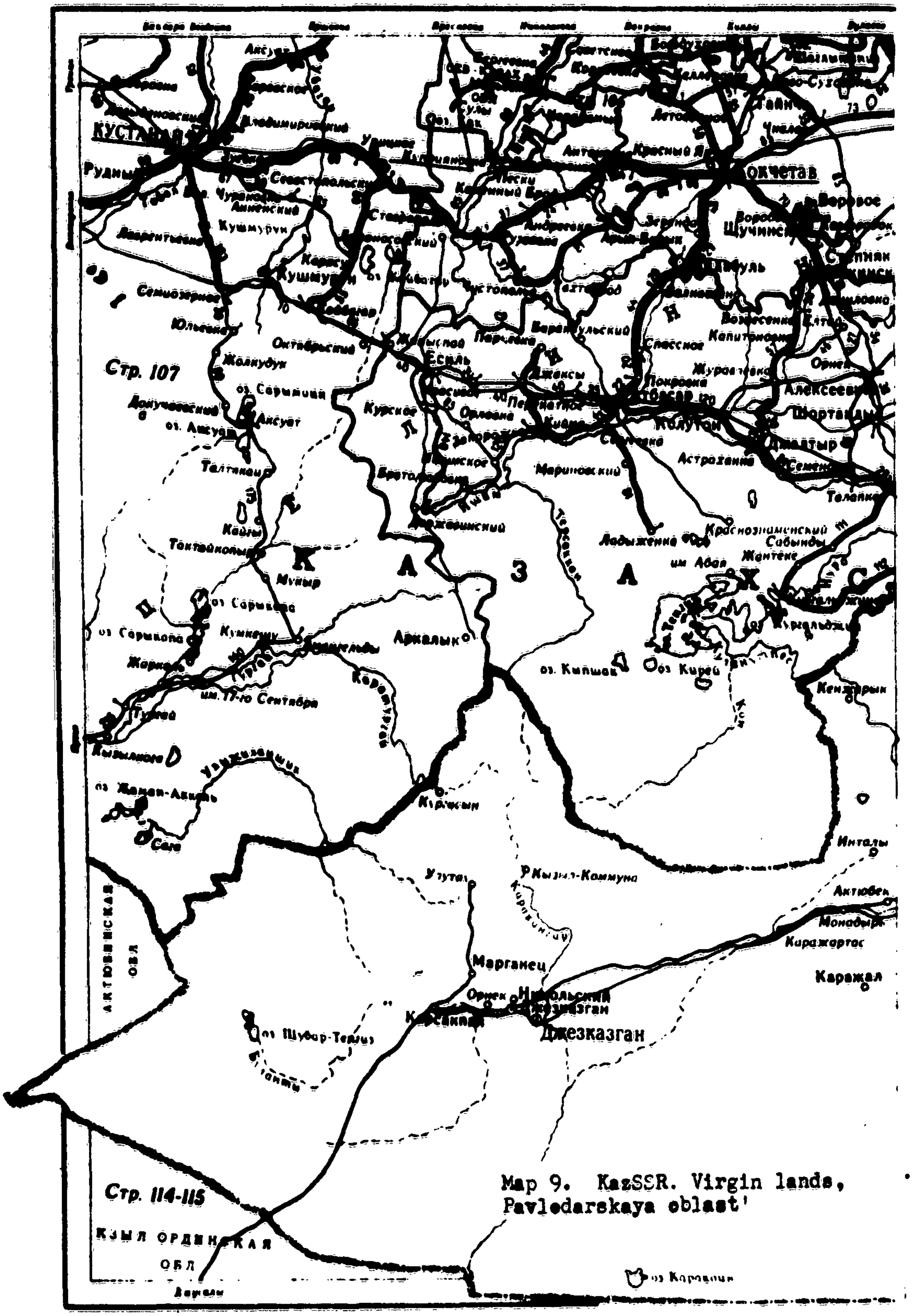
Map 6. BSSR. Grodnenskaya and Brestskaya oblasti



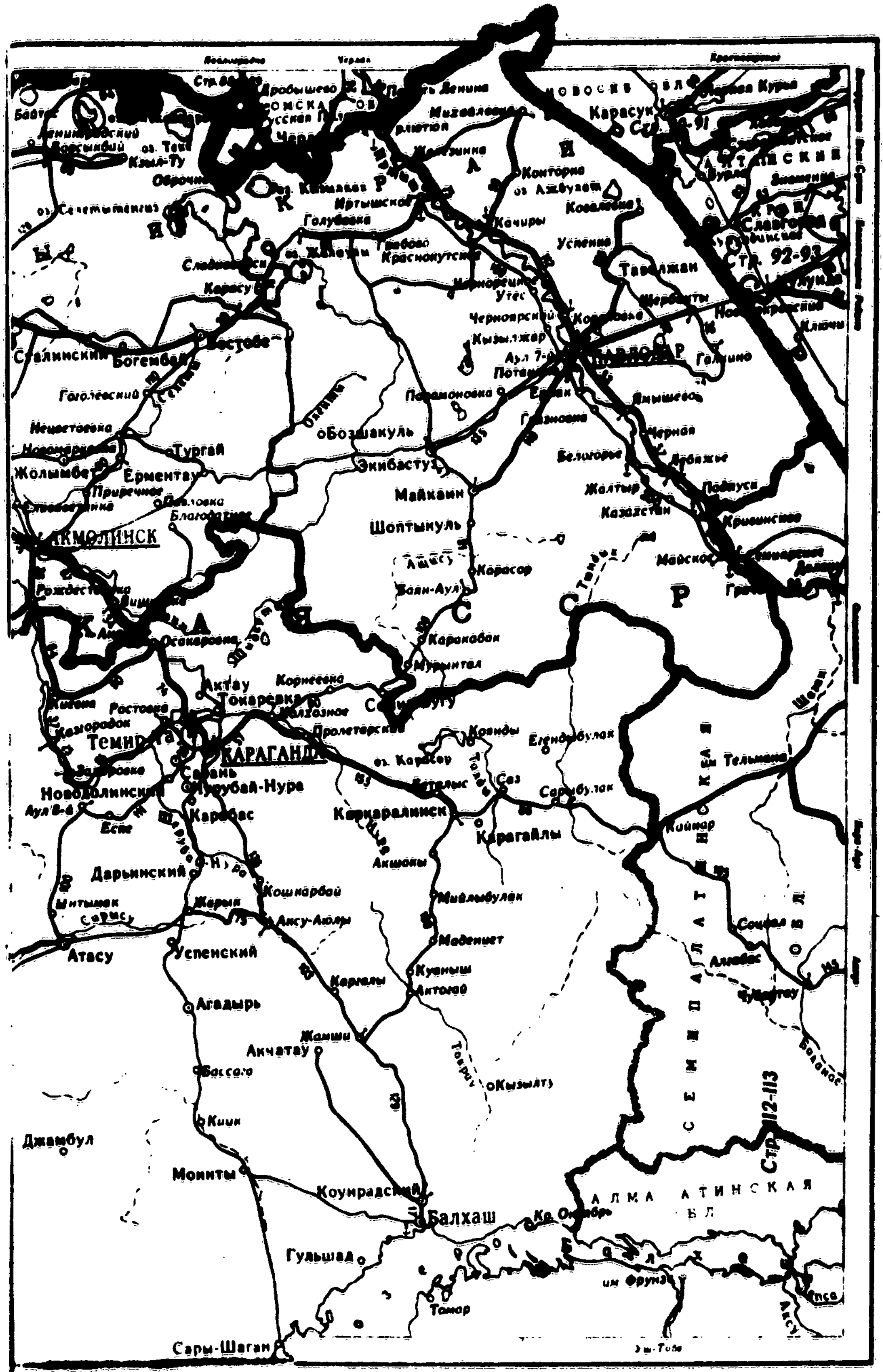
Map 7. KazSSR. Zapadno-Kazakhstanskaya oblast'.



Map 8. Aktyubinskaya and Gur'yevskaya oblasti



Map 9. KazSSR. Virgin lands, Pavledarskaya oblast'



Map 10. Karagandinskaya oblast'

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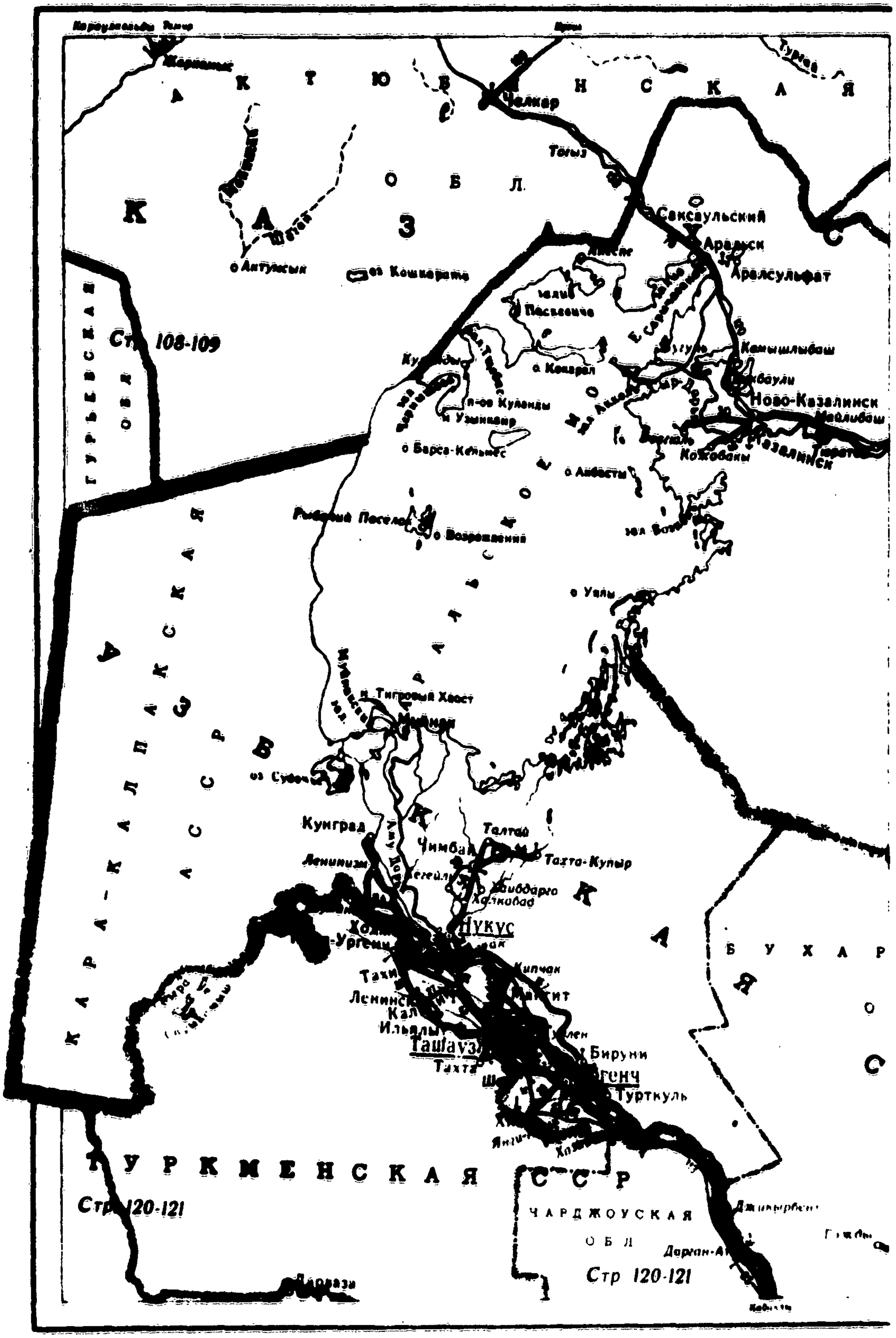
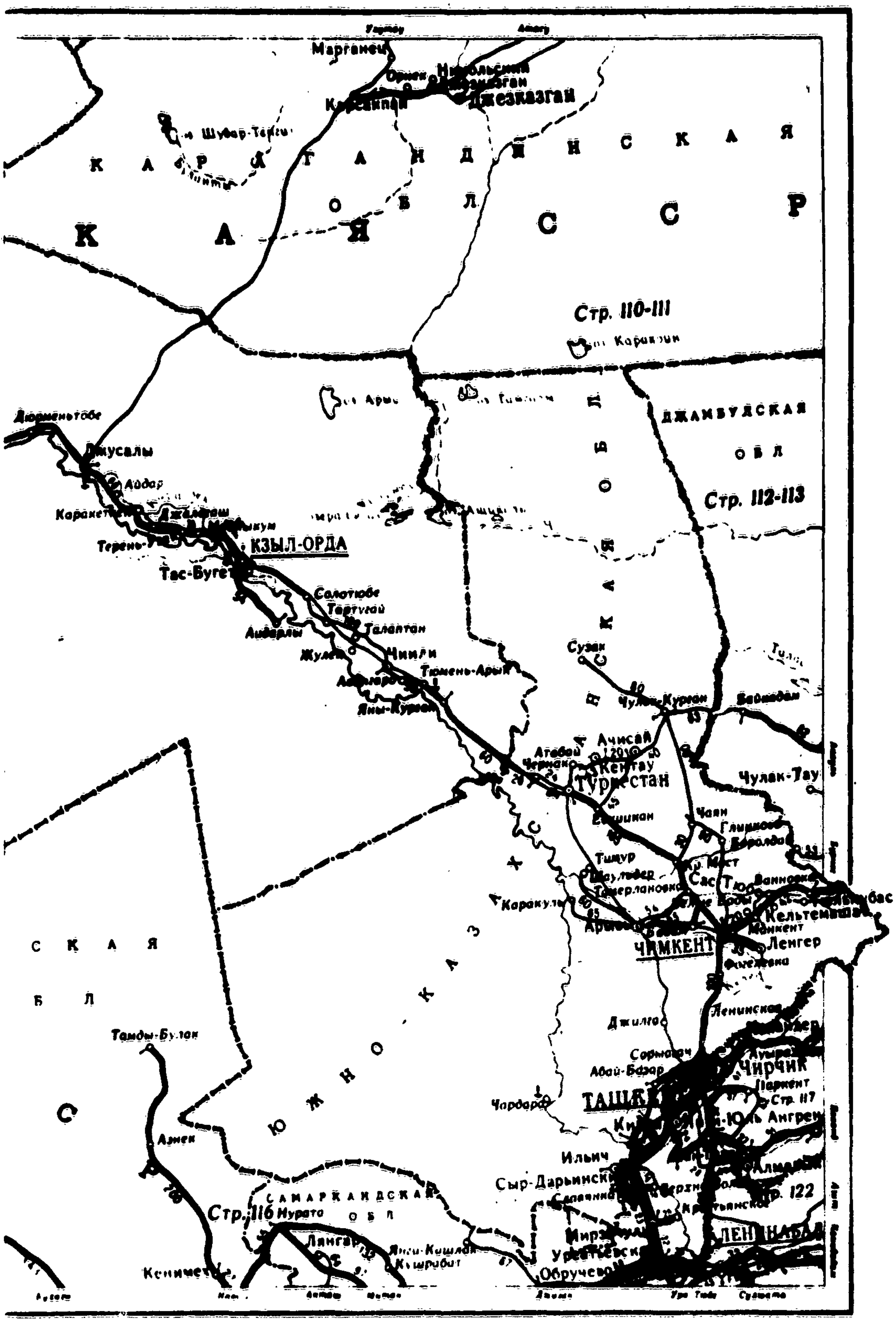
км 40 0 40 80 120 160 км



Map 11. KazSSR, Kzyl-Ordinskaya oblast', and UzSSR, Kara-Kalpakskaya ASSR

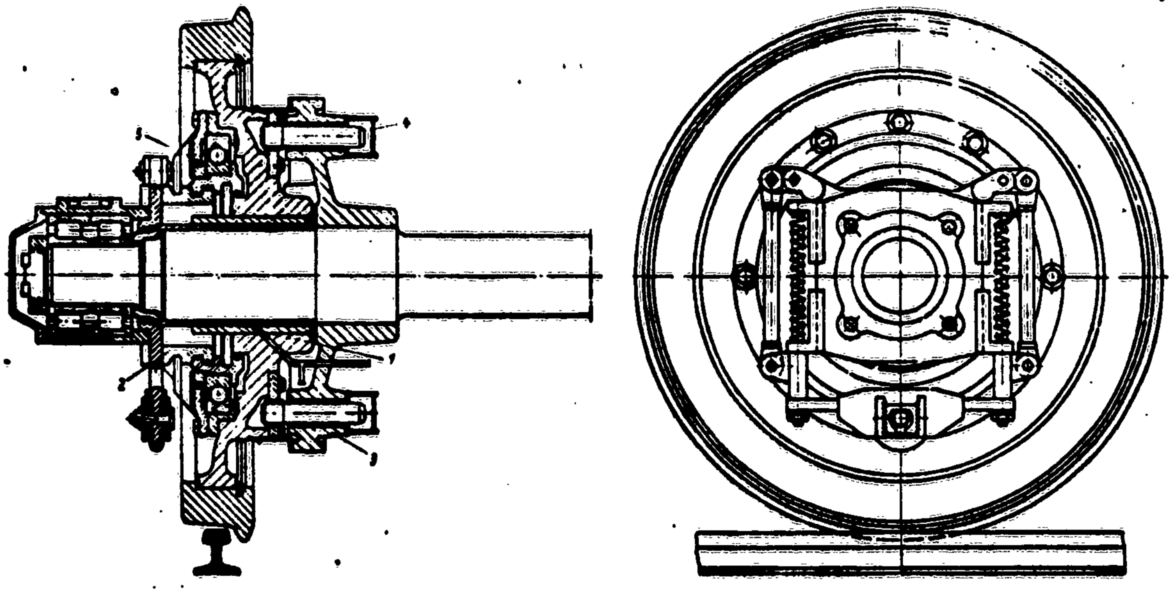


Map 12. KazSSR. Yuzhno-Kazakhstanskaya and Kzyl-Ordinskaya oblasti

Tackert, R. Adjustable-gage railroad axle unit. Deutsche Eisenbahntechnik, no. 3, Mar 1962, 113-118.

Grevesmühl, A. Special constructions. Deutsche Eisenbahntechnik, no. 6, Jun 1962, 268-269.

The difference between Soviet and East German rail gages (1524 mm and 1435 mm) makes the provision of a device for automatic rail-gage adjustment (involving a lateral wheel movement of 89 mm) highly desirable. Constructional problems to be solved in the development of such a device included: 1) a wheel bearing capable of sliding along the axis; 2) a means of locking the wheels in the proper positions; 3) a switching device which would not be affected by the weight of the car; 4) a dog-driver coupling between the wheel and the axle; and 5) a seal to keep dirt and snow out of the locking device and sliding wheel bearing. USSR and GDR designers worked intensively on the problem, and in 1956 a mixed commission examined ten proposed designs, of which they selected two, the KrN I and KrN II*, for further development. The DR III adjustable-gage axle railroad unit shown below is based on these two designs. Its development is considered complete, except for further refinement of some of the details.



DR III adjustable-gage railroad axle unit [21]

1 - sliding bearing; 2 - locking device; 3 - switching device; 4 - dog-driver coupling; 5 - seal.

*Letter designation derived from the names of the designers, Kramer and Necke.

To test the switching and locking mechanisms, a rail-gage transition spur with a short 1524-mm gage track was built at a station near Berlin, and the process of switching from 1435- to 1524-mm gage and back was checked. The DR III was also operationally tested under various load and speed conditions on a number of trips to and from the USSR. The DR III unit was found to be not fully satisfactory from the economic standpoint. A group of designers from industry and the German railroad system, and a similar group in the USSR, have been established to continue the work of development and remedy the observed deficiencies.

C3 Rail--March Order-- Clearances

Schüssler, Massmann, and Wolff. Der Eisenbahnmarsch (Railroad march order). Berlin, Deutscher Militärverlag, 1961. 45-46, 137-138.

Track clearances for structures are prescribed by the regulations governing the building and operation of East German railroads. The following distances between the track midpoint and the edges of platforms must be maintained: 2.20 m in the case of platforms (ramps) built alongside an open through track (right side of Fig. 1), and 1.70 m for platforms (ramps) beside freight tracks within station areas (left side of Fig. 1).

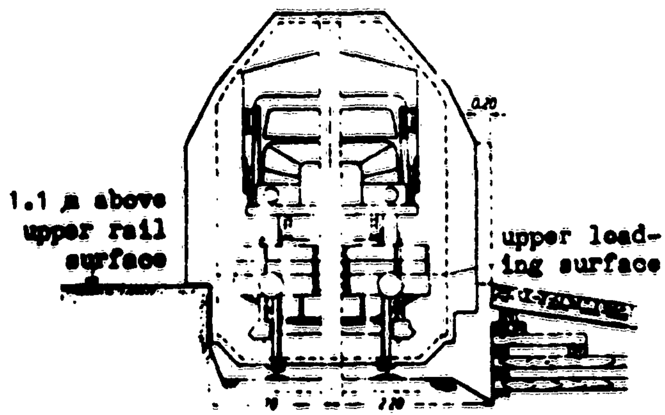
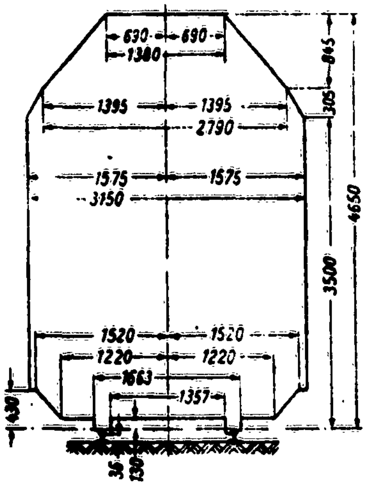


Fig. 1. Prescribed clearances for trackside structures in the GDR [20]

Standard load clearance I (4.65 m maximum height and 3.15 m maximum width) (see Fig. 2 next page) is to be observed on all East German railroads; standard load clearance II (4.30 m high and 3.15 m wide) (see Fig. 3 next page) applies only to some broad gage railroads. Clearance I (Fig. 2) also applies to loads moving on the railroads of Poland, Bulgaria, Rumania, and Czechoslovakia. Regulations require that loads exceeding these limits are to be reported to the proper authorities 7 days ahead of shipment, that the protruding parts be properly marked with white paint and tagged, and that railroad cars with oversize loads carry a warning sign.

[Fig. 2 and 3 on next page].



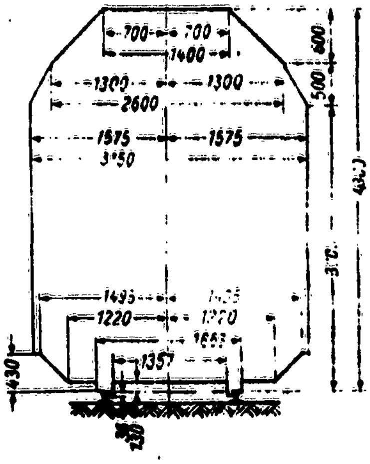


Fig. 2. Standard load clearance I [20]

Fig. 3. Standard load clearance II [20]

C3-- March Order-- Tracklaying

Bakarev, P. I., and Yu. V. Galkin. Tracklaying 25-m preassembled sections using a mobile tracklayer. Transportnoye stroitel'stvo, no. 5, May 1961, 7-10.

The mobile tracklayer (see Fig. 1, below) consists of a model C-100 tractor 1 with a top-mounted frame 2 carrying a built-in winch 3 and generator 4. The carrier is supported on two caterpillar-tracked carriages 5 and is linked to the tractor frame 2 through a trussed beam 6 and a towing device 9. The tractor can operate either on the ground or on a railway track. All mechanisms are independently driven by current from the tractor-driven generator 4. Both cranes 12 for gripping and laying the track sections are operated by winches 7 through guiding pulleys 8.

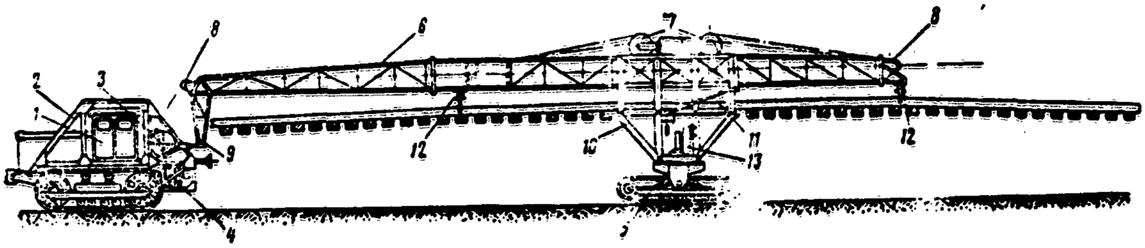


Fig. 1. Mobile tracklayer [2]

The tracklaying procedure is shown in Fig. 2. Using the tractor-mounted winch 3 (see preceding figure), the carriages with the preassembled track sections stacked on them are pulled under the carrier (Operation 1). The handling cranes are lowered and locked onto the track section (Operation 2). The section is then lifted (Operation 3); the tractor moves the required distance (Operation 4); and finally the section is deposited on the prepared track-bed (Operation 5).

The required crew consists of a foreman, tractor driver, carrier operator, and two workers. During the first few days of use on the construction of the Ivdel'--Narykary line, this crew has been able to lay 6 to 8 sections per hour. It is estimated that after the elimination of minor shortcomings the tracklayer will be able to lay 2.0 to 2.1 km of track in an 8-hour shift.

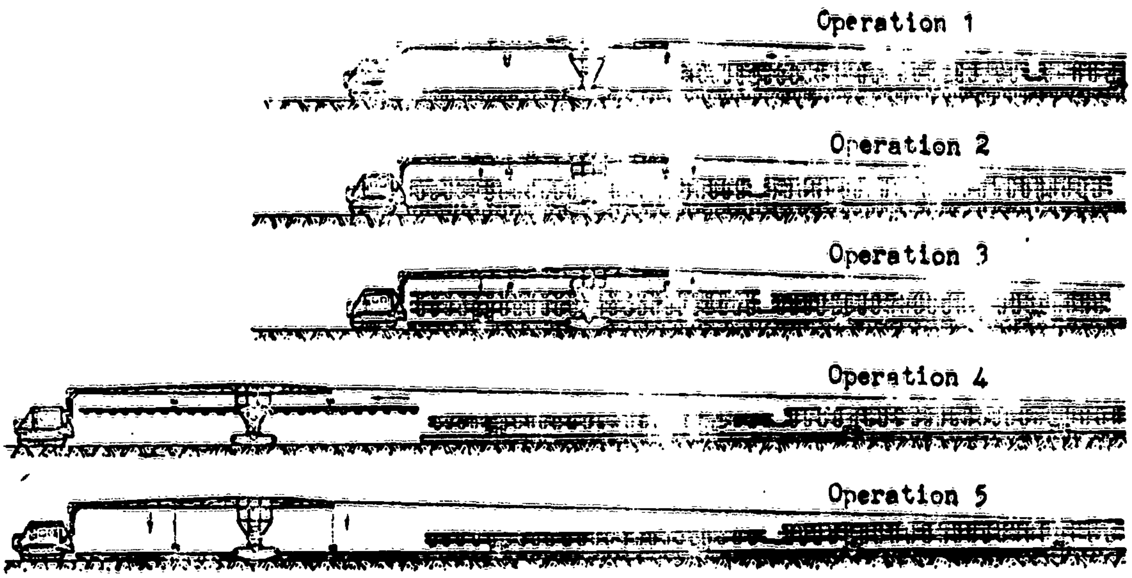


Fig. 2. Tracklayer in operation [2]

TOPIC V. LAUNCH SITE

E6 Accessories-- Gantries

Altitude--250 kilometers. Izvestiya, 7 Sep 62, 6.

Framed by the space helmet is a calm, concentrated face. In his thoughts Andriyan is already there, in flight. For four days he will be away from this planet For four days he will be surrounded by the cosmic darkness, pierced by extremely bright stars. Never yet was there such a flight.

Before stepping into the elevator cabin which will take him to the top of the gigantic rocket carrier, where his spaceship, "Vostok-3", awaits him, Andriyan pauses briefly to look over the Cosmodrome. The base of the launch rig is surrounded by people. Among them he sees his brother cosmonauts, his double [Popovich], designers of gigantic rockets and spaceships. Space ahead!

This is the description which accompanies the photo (see next page). Of interest are the details of the gantry crane at the right of the platform occupied by Andriyan Nikolayev. [Cf. AID Report 62-58, Work Assignment No. 13, Report 4, Topic C-4, Abstract b6, 15-19.]

[Text resumes on p. 22.]

Andriyan Nikolayev and the gantry [1]

TOPIC VII. NATURAL ENVIRONMENTAL CONDITIONS

General climatic data-- USSR (Europe)

Snow Cover

Germany. Reichsamt für Wetterdienst. Beitrag zur Bestimmung der Eintrittszeit der Schneedecke im europäischen Russland (Contribution to the determination of the onset time of snow cover in European Russia). Berlin, 1939. 7 p.

Isolines of equal snow depth are plotted on maps from October to December. Changing ground cover, predominantly closed snow or ice cover, and snow cover less and more than 15 cm deep are indicated. Ice conditions in the Northern Polar Sea and the White Sea and the icing dates of Russian rivers are included. The data for this study were obtained from synoptic observations at more than 150 stations for 1932 to 1936. Statistical analysis of these data indicates the existence of unbroken snow cover over all of European Russia by January. (See Maps 1-10, Appendix I.)

Germany. Reichsamt für Wetterdienst. Über die Schneeverhältnisse im europäischen Russland (On snow conditions in European Russia). Berlin, 1942. 20 p.

Distribution and frequency of snowfall, onset time of snow cover, condition of the snow cover, icing dates of rivers, snow depths, beginning and duration of specific snow depths, decay of the snow cover, and ground thaw periods are plotted on Maps 11-32 (see Appendix I). The data used were obtained from observations made from 1925 to 1929 and 1932 to 1936, and from snow depth measurements from 1891 to 1920. The plotting of the spring thaw reflects the onset of thawing weather, the beginning of the extended snow-melting period, hardening of the ground, and initial drying of the ground. It is shown that the limits of snow melt rapidly advance toward the north and northeast toward the end of April, whereas the limits of drying follow slowly. These conditions are reversed in May, indicating that the area of thawed ground attains its greatest extent in April.

Germany. Reichsamt für Wetterdienst (Luftwaffe). Lufttemperatur, Schneehöhe und Bodenfrosttiefe 1942-43 im Borissow (Air temperature, snow depth, and ground frost depth in Borisov during the 1942-43 period). Minsk, Klima Institut, Dec 1943. 1 p.

The variation of ground frost penetration relative to air temperature and snow depth is graphed for the period from November 1942 to April 1943. Frost penetration reached a maximum of 87 cm about 30 days after occurrence of the -23°C temperature minimum. Depth of the snow cover attained a value of 30 cm. The soil profile consisted of humus and sandy loam from 0 to 20 cm, loamy sand from 20 to 50 cm, and loess

from 50 to 70 cm. The ground was bare and unworked and soil moisture was below normal.

Germany. Wehrmacht. Klimatologische Daten für den Witterungszustand im Winter im Bereich der Heeresgruppe Süd (Climatological data for winter weather conditions in the Southern Army Group Area). Oberkommando der Heeresgruppe Süd, Abt[eilung] Koluft/Ia, 14 Dec, 1941. 4 p.

Climatic data from 20- to 30-year observations in the Khar'kov-Mikhailovka-Pugachev area of the southern part of European Russia are presented. The report includes dates of rivers, snow depths, dates of thaw onset, and dates of hardening and drying of the ground. The ground is unfavorable for military operations from 30 December to 20 April. The most unfavorable period is from January to March, with 8 to 12 snowstorms during each of these months.

Voskresenskiy, K. P. Snow cover. IN: Leningrad. Gosudarstvennyy gidrologicheskiy institut, Trudy, v. 12, 1948, 34-36.

An unstable snow cover usually appears in the central chernozem area between 24 October and 11 November. A stable snow cover is usually established between 26 October (in the Orlovskaya and Tambovskaya oblasti) and 19 December (south of the Kurskaya and Voronezhskaya oblasti). Maximum snow depth was observed in early March. The snow cover disappeared between 5 March (in the southwest) and 5 April (in the northeast). Snow melting continued for periods of 27 to 29 days (Tambov, Livny) to 33 to 37 days (Kursk, Orel). Water content of the snow before melting attains a maximum of 120 mm in the central Russian plateau region, diminishing to 60 to 80 mm in the south.

Ice

Germany. Deutsche Seewarte. Der Eisaufbruch in Osteuropa (Ice breakup in Eastern Europe). 1941. 5 p.

The time elapsed between the first breakup and the complete disappearance of river and lake ice in northern and eastern Russia is comparatively short, often only a few days. First the snow melts; the meltwater collects in the rivers and lakes, causing them to rise and loosen the ice cover from the shore. Wind action accounts for continued breakup of ice on the lakes, while stream action produces the same effect on the rivers. Individual ice floes melt more rapidly in the rivers than in the lakes, which warm up more slowly because of their greater volume of water. The earliest, mean, and latest dates of ice breakup are tabulated for various rivers. Ice breakup occurs earlier on the larger rivers than on all other waters, coming immediately after the onset of an

average diurnal temperature of 0°C. The smaller rivers and streams follow at an interval of 1 to 3 weeks; next the canals; and finally the lakes. The locations of drift ice concentrations are indicated, and the appearance and disappearance of earliest and latest ice at various points of the White Sea are tabulated.

Germany. Reichsamt für Wetterdienst (Luftwaffe). Die Stromgebiete im Mittelabschnitt der Ostfront. Heft 1: Stromgebiet des Pripjet (Drainage areas in the central sector of the Eastern Front. no. 1: Drainage areas of the Pripet River). Minsk, Klima Institut, Dec 1943. 49 p.

The physical and geographical features of the Pripet River drainage basin are described. The various soil types, including the podzolic soils and their transitional forms, are defined. The formation, extent, and icing of bogs are discussed. Thickness of icing on bogs is a function of water conditions, composition and distribution of plant cover, and above all of snow cover conditions. Frost penetrates rapidly in dry bogs in the absence of a protective snow cover. An ice cover formed over the bog surface after flooding acts as an insulator, preventing deep frost penetration. The thawing processes of bogs are analyzed and equations are given for determining the depth of thawed soil. Climatic conditions, including temperature, precipitation, snow cover, and fog, and hydrological conditions, including dates of icing and run-off, are tabulated.

Germany. Wehrmacht. Die Eisdecke des Dnjepr. Schneehöhen im Abschnitt des AOK 8 (Ice cover of the Dnepr River. Snow depths in the AOK 8 sector). Wehrgeologenstelle 15, Supplements 6 and 7, 1943. 2 p.

Ice cover thicknesses from December to March on the Dnepr River near Kremenchug are given for a warm winter (1938-39), an average winter (1932-33), and a severe winter (1927-28). The bearing capacity of the homogeneous ice cover varies from 3.5 tons for thicknesses of 20 to 25 cm to 60 tons for thicknesses greater than 60 cm. The mean and maximum snow-cover depths for the areas southeast and northeast of Kremenchug are tabulated.

Voskresenskiy, K. P. Winter regime of rivers. IN: Leningrad. Gosudarstvennyy gidrologicheskiy institut. Trudy, v. 12, 1948, 58-63, 190-263.

Data obtained from 156 locations in the Orlovskaya (Orel), Tambovskaya, Kurskaya, and Voronezskaya oblasti up to 1947 are tabulated, mapped, and discussed. The autumn ice drift period varied from 10 to 15 days to a month. The average closing (icing over) date fell between 20 November (in the northeast) and 5 December (in the southwest), and

the average ice breakup date fell between 20 March (in the southwest) and 10 April (in the northeast). River ice cover in the central chernozem area is usually stable and lasts from 135 to 145 days (in the north) to 125 days (in the south). Observations of the ice cover thickness from 1931 to 1947 showed mean values for the area of 40 to 50 cm, reaching 60 cm near the end of winter. Mean thickness rose as high as 70 to 80 cm during severe winters and fell as low as 20 to 30 cm during warm winters. Ice cover thickness was usually greater in small rivers than in large rivers.

Opening and freezing of rivers and lakes. IN: Spravochnik po vodnym resursam SSSR. Tom 12: Ural i yuzhnoye priural'ye, chast' vtoraya (Handbook of water resources of the USSR. v. 12: The Ural and southern cis-Ural regions, part 2). Leningrad, Gosudarstvennyy gidrologicheskiy institut, 1936. 779-800.

Dates of river icing and breakup in the Ural Mountains and neighboring regions from 1881 to 1930 are tabulated. Formation of river ice begins near the middle of October in the northeastern Urals. Onset of spring ice breakup usually falls in April. The breakup is completed during the first part of May. Ice drifts occur for 2 to 8 days in the spring and 2 to 15 days in the autumn. The rivers of the Kama and Tobol basin are clear of ice for 140 to 210 days in the year, while those of the Ural basin are clear for 170 to 259 days. The average icing-over period in lakes extends from the end of September to the end of November. The onset of spring breakup falls between the end of March and 28 or 29 May.

General climatic data-- Kazakh SSR

Chigarkin, A. V. Landscape characteristics of the northeastern Aral Sea region and of the southwestern rim of the Kazakh fold. IN: Akademiya nauk Kazakhskoy SSR. Otdel (sektor) geografii. Trudy, vyp. 6: Voprosy geografi Kazakhstana (Transactions, no. 6: Problems of the geography of Kazakhstan). Alma-Ata, 1960. 6-13.

Davydova, M. I., et al. Fizicheskaya geografiya SSSR (Physical geography of the USSR). Moskva, Uchpedgiz, 1960. 425, 428-429.

Gayel', A. G. Freezing and thawing of soils in the northern Aral Sea region during the winter of 1947-1948. Voprosy geografii, v. 15, 1948, 123-146.

Grinev, V. Ya., I. Zaytsev, and I. Yagovkin. Hydrogeological map of the Karsakpay region. IN: Spravochnik po vodnym resursam SSSR. Tom 13: Severnyy Kazakstan (Handbook of water resources of the USSR. v. 13:

Northern Kazakhstan). Leningrad, Gosudarstvennyy gidrologicheskiy institut, 1933. 209 (ch. 3).

Kalugin, S. K. Formation and distribution of underground waters of the Dzhezkazgan--Ulutau region. IN: Ob"yedinennaya nauchnaya sessiya po problemam razvitiya proizvoditel'nykh sil Tsentral'nogo Kazakhstana. Proizvoditel'nyye sily Tsentral'nogo Kazakhstana. Trudy sessii. t. 5: Energetika i vodnoye khozyaystvo, stroitel'stvo i transport (Productive forces of Central Kazakhstan. Transactions of the [Joint scientific] session [on problems of the development of productive forces of Central Kazakhstan, 1st, Karaganda, 1958] v. 5: Power engineering, water supply engineering, construction, and transportation). Alma-Ata, Izd-vo AN Kazakh SSR, 1959. 46-47.

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"Melkosopochnik Region"

The Kazakhskiy melkosopochnik region (a Kazakh upland characterized by a highly dissected erosional topography with development of numerous small mounds) extends from the Turgayskaya ravnina (Turgay Plain) on the west to the Altai Mountains in the east. Its southern reaches are occupied by Lakes Balkhash, Sasykkol', and Alakol', and by the desert plain of Bet-Pak Dala. The Zapadno-Sibirskaya nizmennost' (West Siberian Lowland) forms the northern boundary of the Kazakhskiy melkosopochnik. [4]

The northern and western parts of the Kazakhskiy melkosopochnik belong to the climatic zone of the Zapadno-Sibirskaya nizmennost', while the southern part climatically resembles the Turanskaya nizmennost' (Turan Lowland). Ulutau, Karkaraly, Chingiz-tau, and other mountains are characterized by climatic zonality depending on elevation. [4]

Polar air predominates over the melkosopochnik region throughout the year. This air mass is bounded on the north by arctic and in the south by tropic air. In consequence the region is subject to frequent invasions of either cold arctic air or hot tropical air. The great distances separating the entire region from the ocean tend

to give it a continental climate, characterized by large ranges of daily and annual air temperature variation, cold winters, hot summers, and limited precipitation.

January is the coldest month, with mean air temperatures of -16° to -19°C and an absolute minimum of -45°C. July is the warmest month, with a mean of 22°C and an absolute maximum of 45°C. Precipitation amounts to about 250 mm, of which the largest part occurs during the summer. Summer precipitation in the Karkaralinsk area amounts to 132 mm, about one-half the annual total, while winter precipitation is only about 10% of the total. Annual precipitation in the mountainous areas reaches about 300 mm. The volume of annual precipitation fluctuates sharply. Total precipitation in some years amounts to only one-half of the average annual total. The frequent winds with velocities of 5 to 6 m/sec intensify surface evaporation; annual water loss reaches a value of 2000 mm. Maximum cloudiness occurs in December; the minimum falls in August. The average annual cloudiness is ~50%. Relative humidity reaches its maximum of 83% in January; its minimum of about 35% falls in July.

The winters are severe and cold with strong winds. The air temperature may drop to -50°C in the eastern part of the melkosopochnik. Prevailing northeast winds from the Siberian anticyclone intensify the effects of the low temperatures on living organisms. The relatively thin (up to 30 cm) snow cover remains on the ground as long as 120 days. Driving winds drift the light snow cover into the depressions.

The brief spring of about two weeks duration is characterized by the rapid and continous thawing of snow. The melting of the light snow cover does not require a large amount of heat, and the exposed ground warms up quickly. Light frosts are common. Spring vegetation draws on the moisture collected in the depressions which were packed with drifting snow by the winter blizzards. There is some rain; air temperatures are relatively low, and evaporation is not intensive. The growth and flowering of ephemeral vegetation is very rapid. [4]

Summer begins as early as May. That month is usually sunny, and sometimes hot, with a mean temperature of 16° to 17°C. In June the temperature rises to ~40°C. Frost may occur at night in June as well as in May. Other factors contributing to intensive heating are the lack of a continuous vegetation cover, nearly complete or complete evaporation, the relatively clear skies, and the absence of bodies of water. Summer showers have practically no effect on the condition of the ground, since most of the water runs off into gullies. Dry, northern winds predominate.

The fall lasts longer than the spring. The autumnal temperature drop is more gradual than the spring rise. Meridional circulation of air masses is intensified. Intrusions of arctic air masses produce anticyclonic conditions, with clear, windless weather and low temperatures at night.

According to Voznesenskiy [24] whose statements are based on data collected from 1863 to 1930 by 36 stations in Kazakhstan and neighboring

regions, the average duration of the snow cover varies from 150 to 180 days. An average snow cover depth of 5 cm or more was observed at Kazalinsk for 80 days, at Zvenigorodok for 170 days, and at Urkash for 153 days. The depth of snow cover before the spring thaw was less than 10 cm south of lat. 48° N., increasing to 40 to 60 cm further north.

Karsakpay--Baykonur Region [25] (See Appendix II, Map 1.)

The Karsakpay--Baykonur region is located between lat. 67° and 75° N. and long. 47° E. It has a gently rolling relief characterized by irregular development of the melkosopochniki. The topography of the region and the irregular distribution of the mounds (sopki) are governed by the geographic structure and the semiarid weathering conditions. The greatest dissection occurs in areas of crystalline schists and metamorphic and igneous rocks. The mounds, which are basically made up of weather-resistant rocks, attain elevations of 385 m above sea level and relative elevations (above surrounding terrain) of 50 to 60 m.

The hydrographic network of the region includes the Ul'kenzhezdy, Balazhezdy, Kumula, and Bulanty (Baykonur) Rivers. The water regime of these rivers attains its maximum in the spring, during the snow melt period. From about the second half of June, all these rivers become dry and present a series of elongated water pools separated by dry sections of river bed.

The Karsakpay-Baykonur region has a continental climate with an annual precipitation of less than 200 mm (annual precipitation based on observations from 1926 to 1930 is 152 mm). The average annual temperature ranges from 1.7° to 4.4°C. The average for January varies between -14° and -18°C; the average for July varies from 22° to 25°C. The prevailing winds are from SSW and NNE. Approximately one-half of all precipitation occurs as snow, which remains on the ground 4 to 5 months (from November to March). Brisk, almost continuous winds blow the snow off the level ground into the ravines and river beds. Intensive thawing begins in the first half of April. The great intensity of this thaw facilitates surface runoff. Precipitation in the form of rain (except for sudden showers) does not run off, but soaks into the parched surface strata. The annual evaporation from open water surfaces exceeds the total annual precipitation by 4 to 5 times.

Dzhezkazgan--Ulutau Region

This region occupies the southwestern part of the melkosopochnik. Administratively it forms part of the Karagandinskaya oblast'. It has a sharp continental climate characterized by hot, dry summers and cold winters with scanty snow. The annual air temperature (averaged over a period of many years) varies between 2.5° and 5.0°C, with a seasonal variation of 86°C. The average annual precipitation is 120 to 160 mm, while evaporation from water surfaces for a year may be as high as 1300 mm. [16]

Orographically the region is a highly dissected, rolling hill steppe typical for Central Kazakhstan. It has a pronounced hypsometric slope extending to the south, west, and north from the Ulutau Mountain

massif. The climatic and orographic features of this region are reflected in its weakly developed hydrographic network. The larger streams, having well-developed valleys, include the Sarysu, Karakingir, Dzhezdy, Sarykingir, Karaturgay, and Zhaksykon Rivers. These streams are intermittent; their spring run-off lasts from 10 to 30 days in the form of extensive floods. The rest of the year there are only elongated pools of water along the stream bed. Two of the above streams, the Karakingir and the Sarykingir, join above Dzhezkazgan to form the Kingir River, which is the only one which may occasionally contain water at any time during the year. The waters of the Kingir River, impounded by a large dam erected in the town of Dzhezkazgan, form a reservoir with a capacity of 173 million cubic meters of water. [3]

The entire Dzhezkazgan-Ulutau region is overlain by Quaternary deposits such as sandy loams, sand, gravel, and clayey soils. The thickness of these varies from 0.2 to 0.5 m at higher elevations, 4 to 5 m on slopes, and 6 to 12 m in river valleys [16]. Alluvial deposits are the only deposits bearing water (see Appendix II, Map 2).

A comparison of data on winter conditions in the northern Aral Sea region during the winter of 1947-48 with data for the preceeding 20 years shows that the winter of 1947-48 was mild, with no snow cover and temperatures below freezing on only 108 days as compared with an average of 138 days for the previous 20 winters [6]. Depth of frost penetration was 1.5 m in sandy soils and 0.5 m in clayey soils. The high groundwater level in sandy soils aided freezing of the capillary zone to a greater depth. Depth of frost penetration in this region is influenced mainly by low temperatures.

A summary of climatic data for select points in the above areas is presented in the table given on the following page.

Chief indicators of climatic elements [3]

Observation points	Coordinates		Long-range average air temperature			Average annual temperature amplitude	Absolute maximum temperature	Absolute minimum temperature	Absolute annual temperature	Duration of frostless period (days)	Average annual wind velocity (m/sec)	Long-range average relative humidity at 1 pm (%)			Average multiyear precipitation (mm)
	Latitude	Longitude	January	June	Annual							Maximum (summer)	Maximum (winter)	Annual	
Karsakpay	47° 50'	66° 45'	-15.3	23.6	4.0	38.9	42	-41	33	139	4.2	28	82	54	121
Dzhezkazgan	47° 48'	67° 43'	-15.1	24.8	4.9	39.9	43	-43	36	140	--	--	--	--	115
Saksaul'skaya	47° 05'	61° 09°	-13.4	27.3	7.2	40.7	42	-36	78	168	--	25	80	49	91
Aral Sea	46° 50'	61° 41'	-13.5	26.3	6.8	39.8	42	-36	78	168	4.1	32	80	54	103
Kazalinsk	45° 46'	62° 07'	-11.7	26.1	8.0	37.8	42	-34	76	176	3.2	30	78	50	118
Dzhusaly	45° 31'	64° 05'	-11.6	27.2	8.4	38.8	44	-36	30	176	3.4	24	81	48	98

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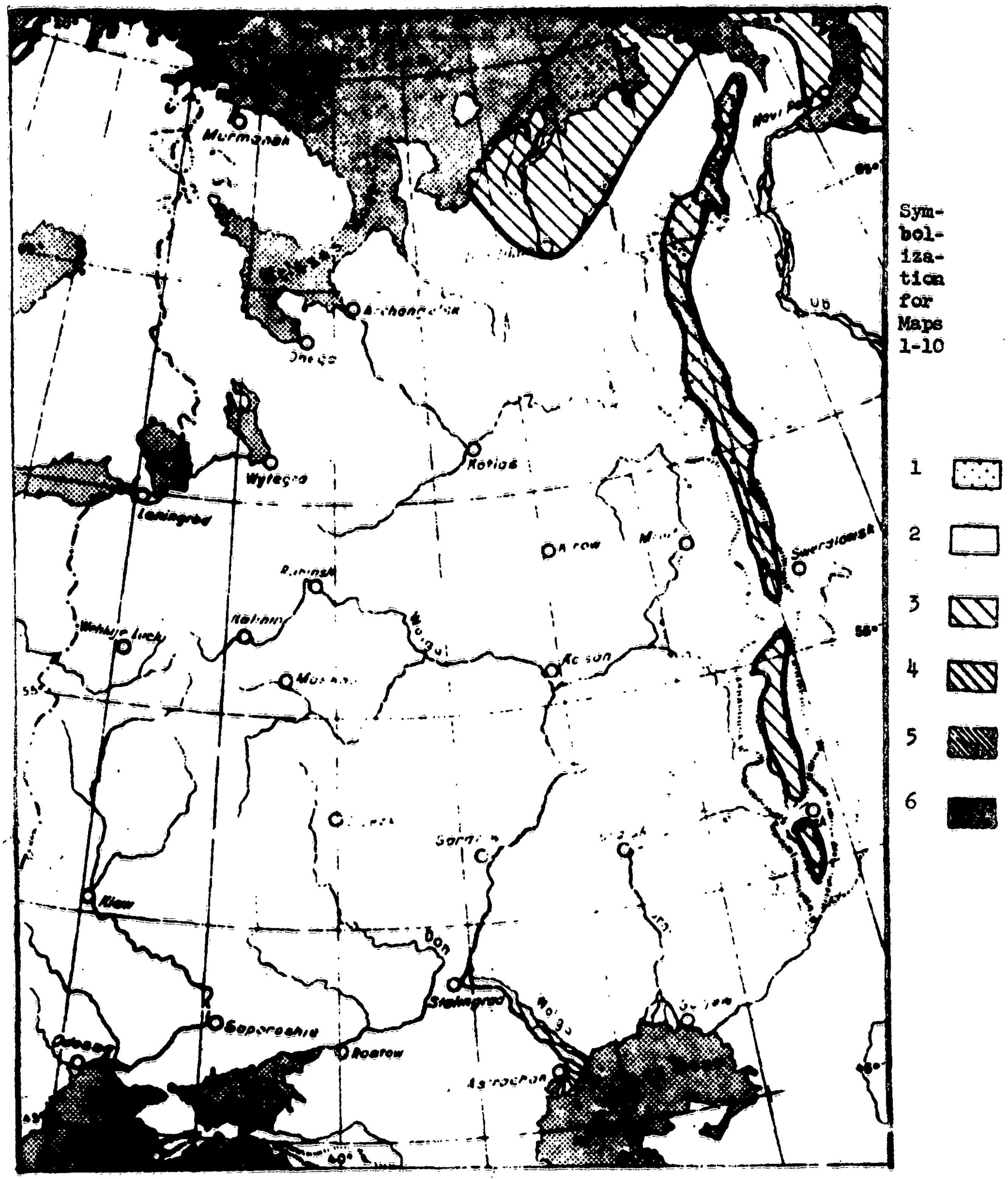
APPENDIX I. Maps

[To accompany Topic VII, General climatic data-- USSR (Europe)]

Map Index

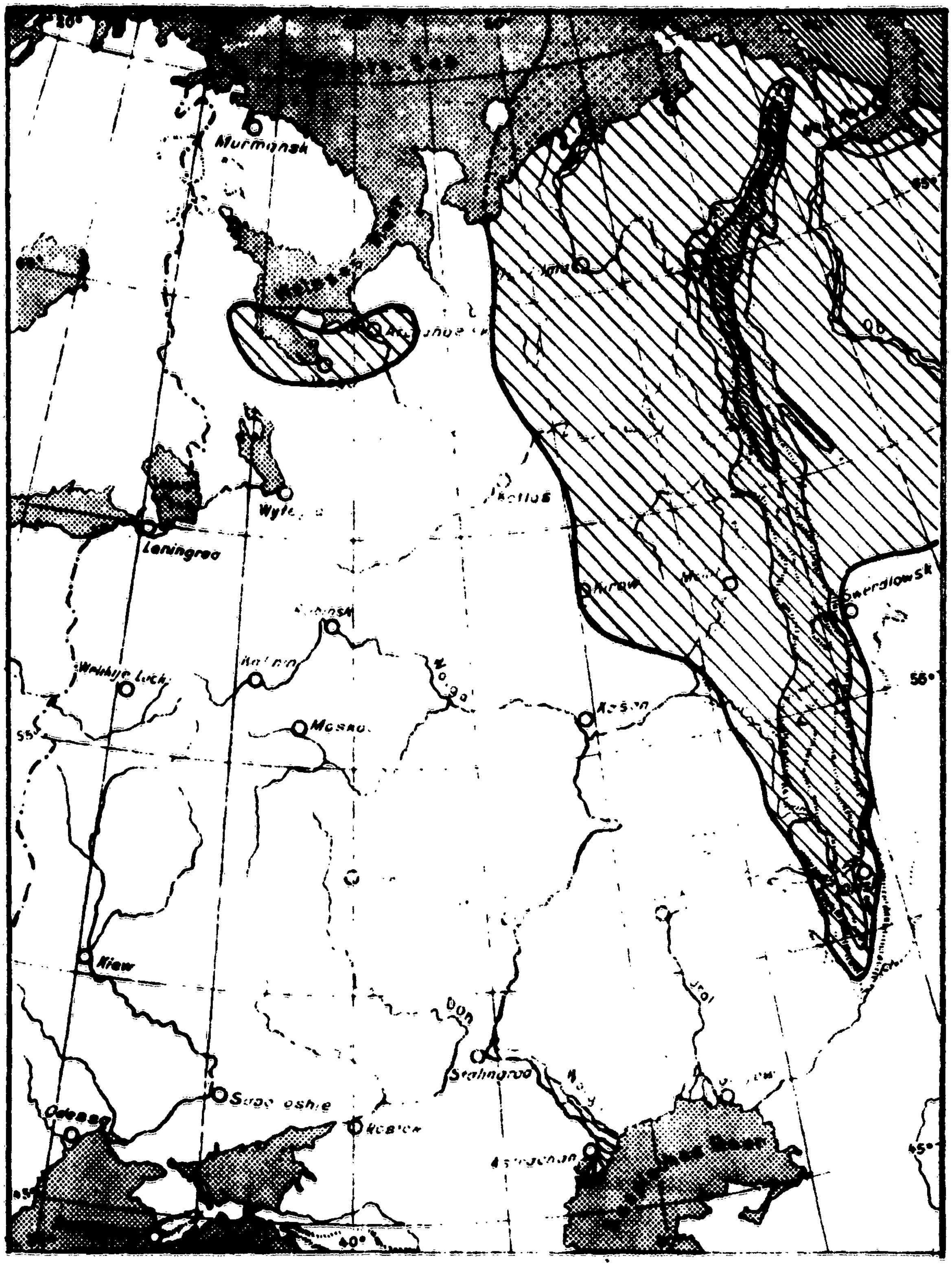
Germany. Reichsamt für Wetterdienst. Beitrag zur Bestimmung der Eintrittszeit der Schneedecke im europäischen Russland (Contribution to the determination of the onset time of snow cover in European Russia). Berlin, 1939. 7 p.

Germany. Reichsamt für Wetterdienst. Uber die Schneeverhältnisse im europäischen Russland (On snow conditions in European Russia). Berlin, 1942. 20 p.

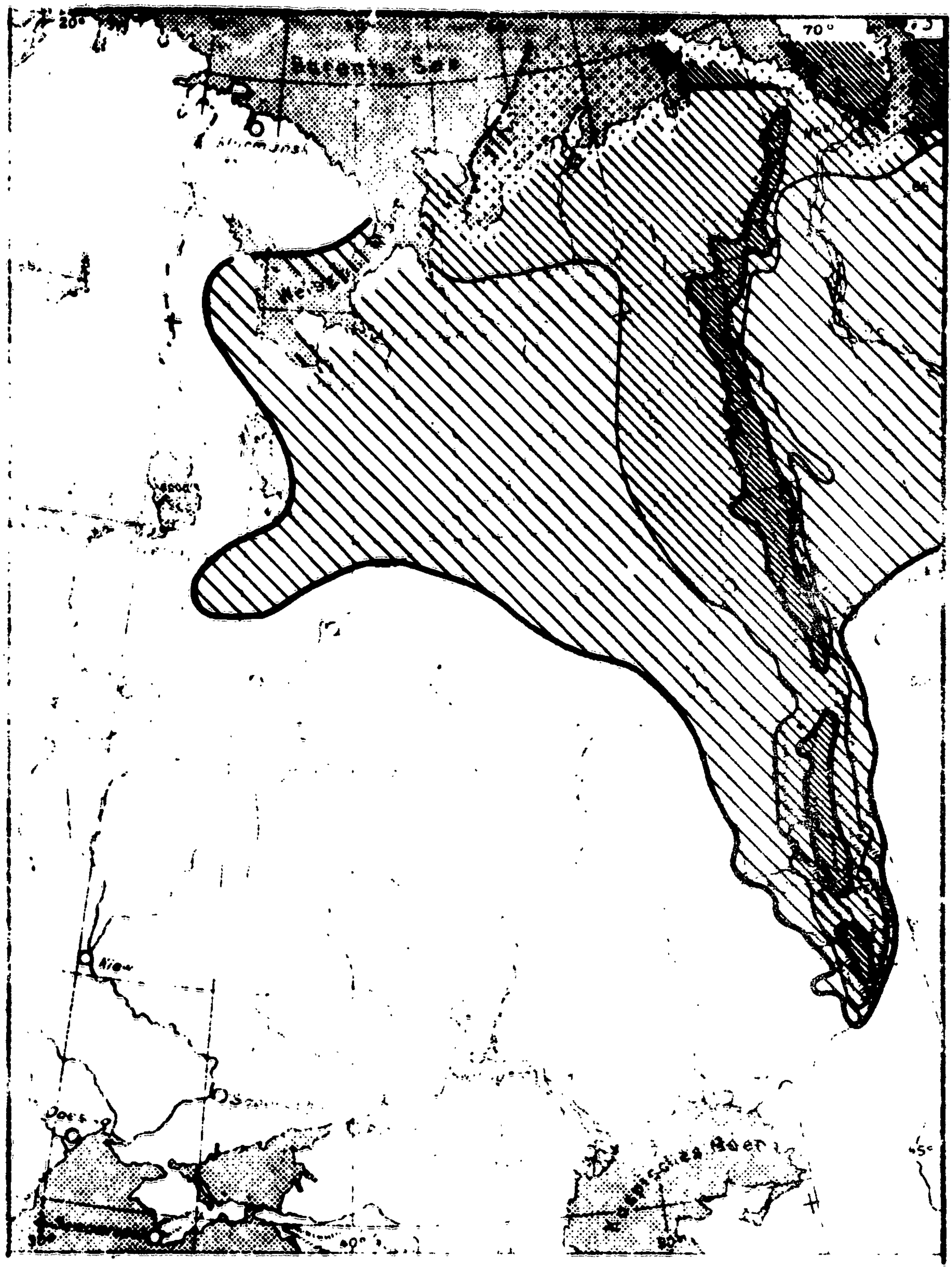


Map 1. Isolines of equal snow depth on 1 October

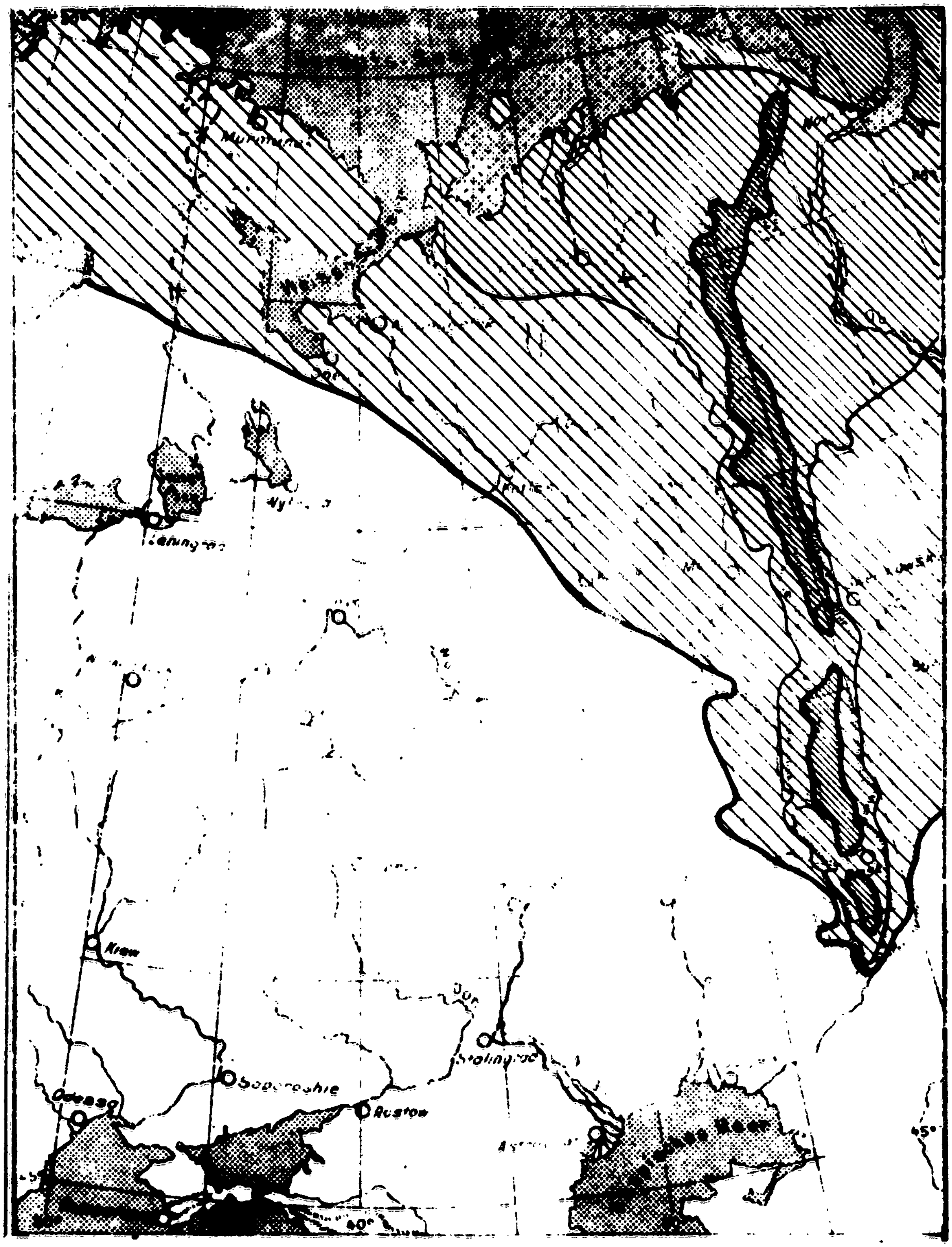
1 - ice cover; 2 - ground clear of snow; 3 - alternating cover; 4 - prevalent continuous (closed) snow or ice cover; 5 - snow depth 15 cm; 6 - snow depth 15 cm.



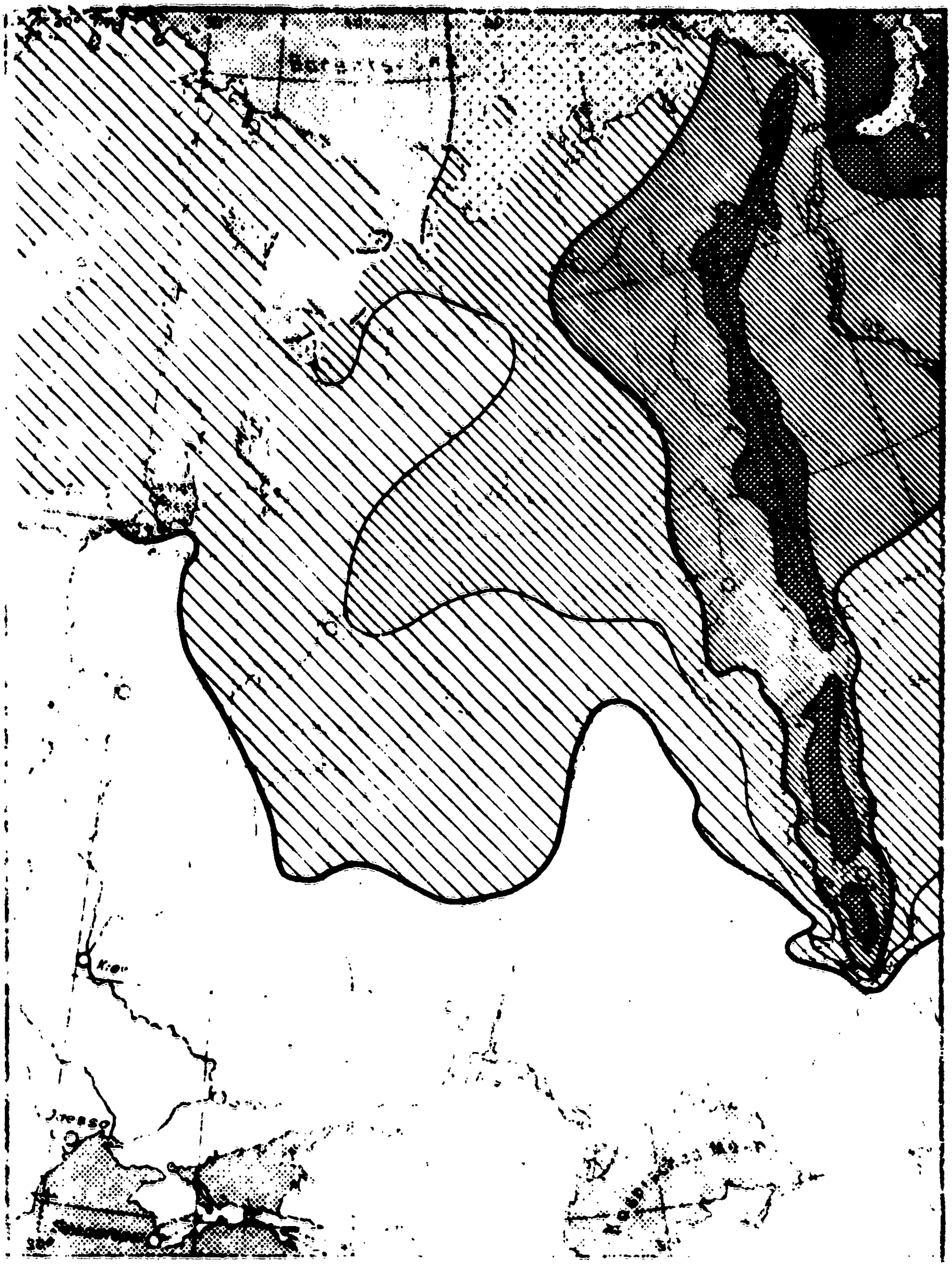
Map 2. Isolines of equal snow depth on 10 October



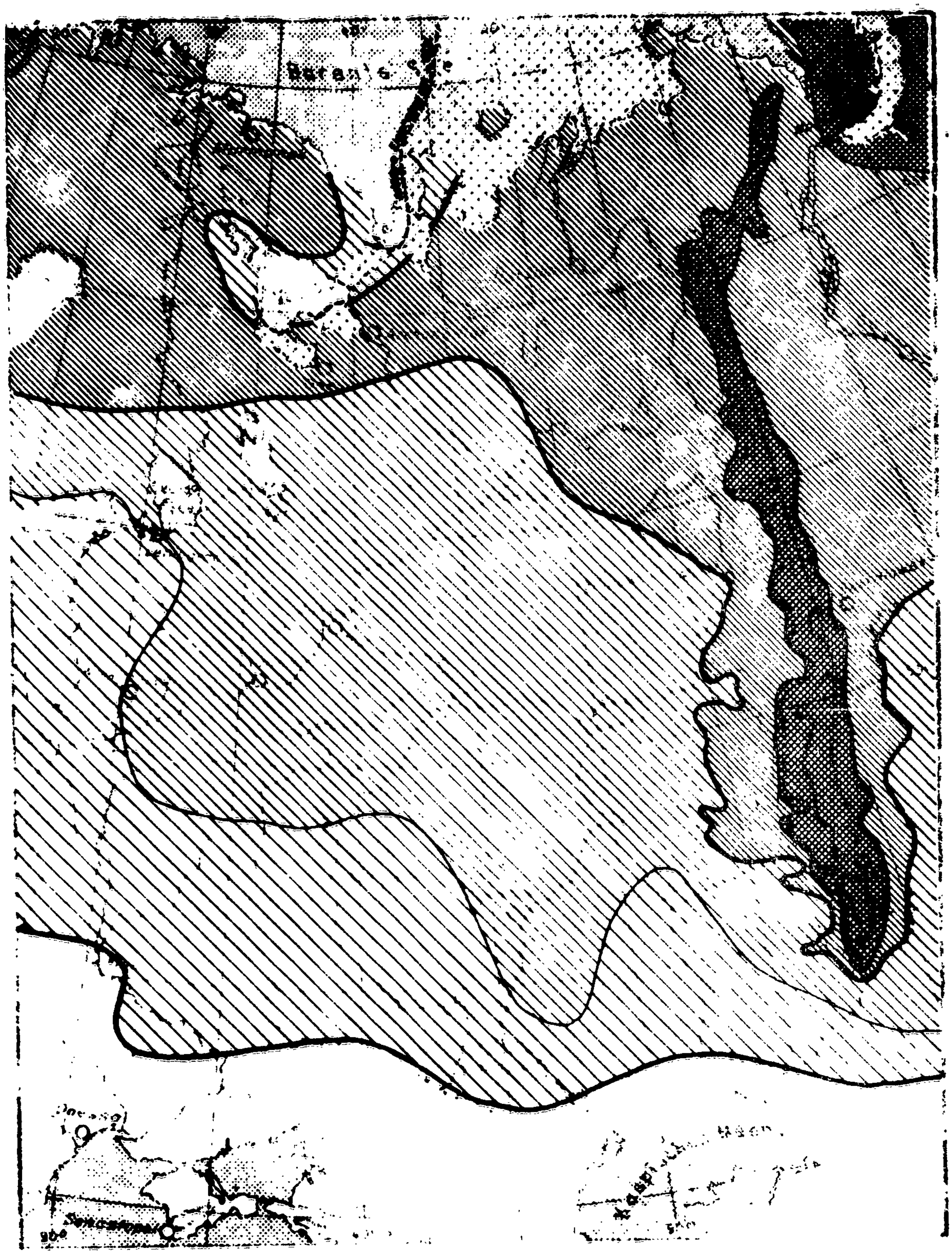
Map 3. Isolines of equal snow depth on 20 October



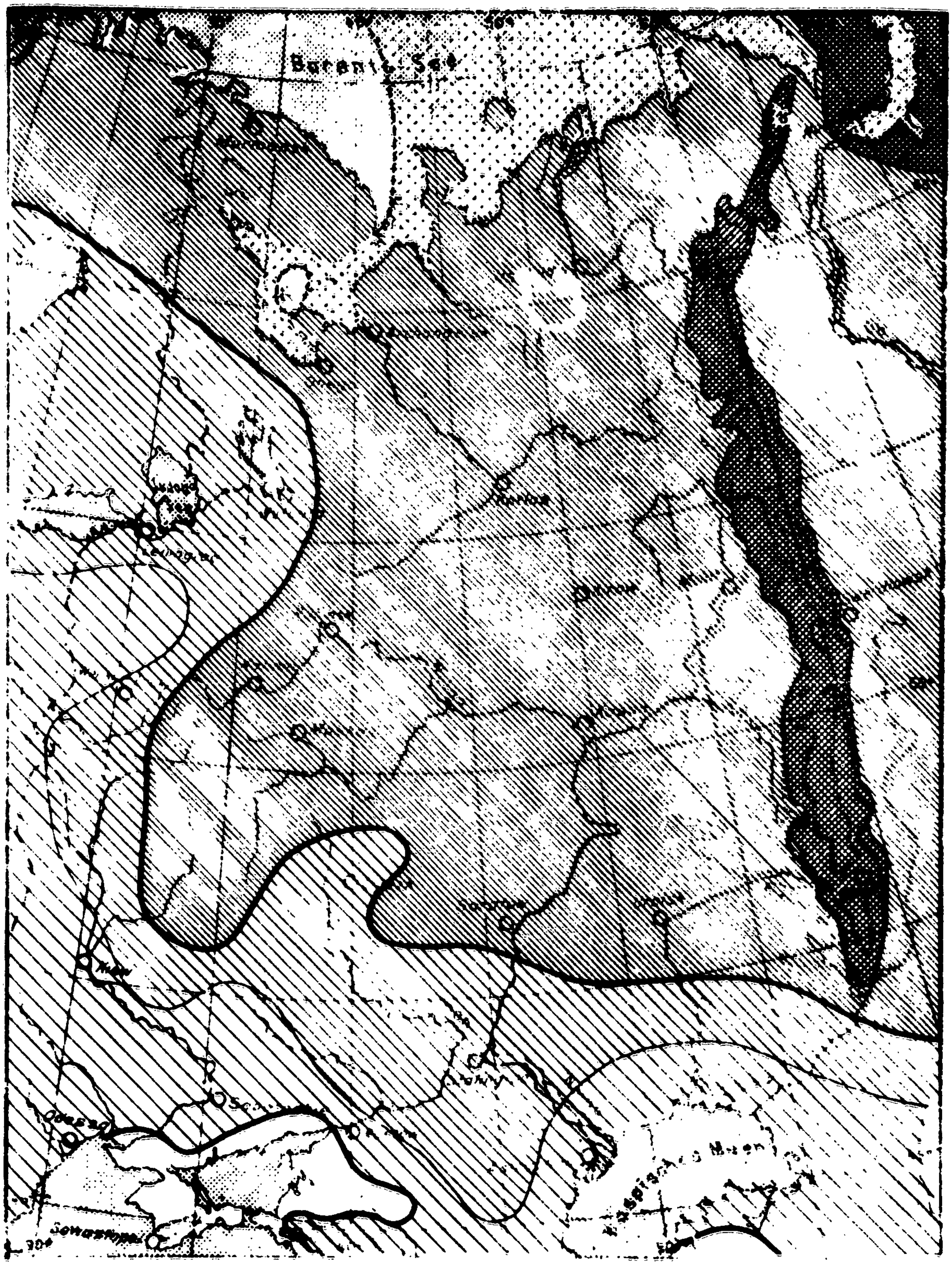
Map 4. Isolines of equal snow depth on 30 October



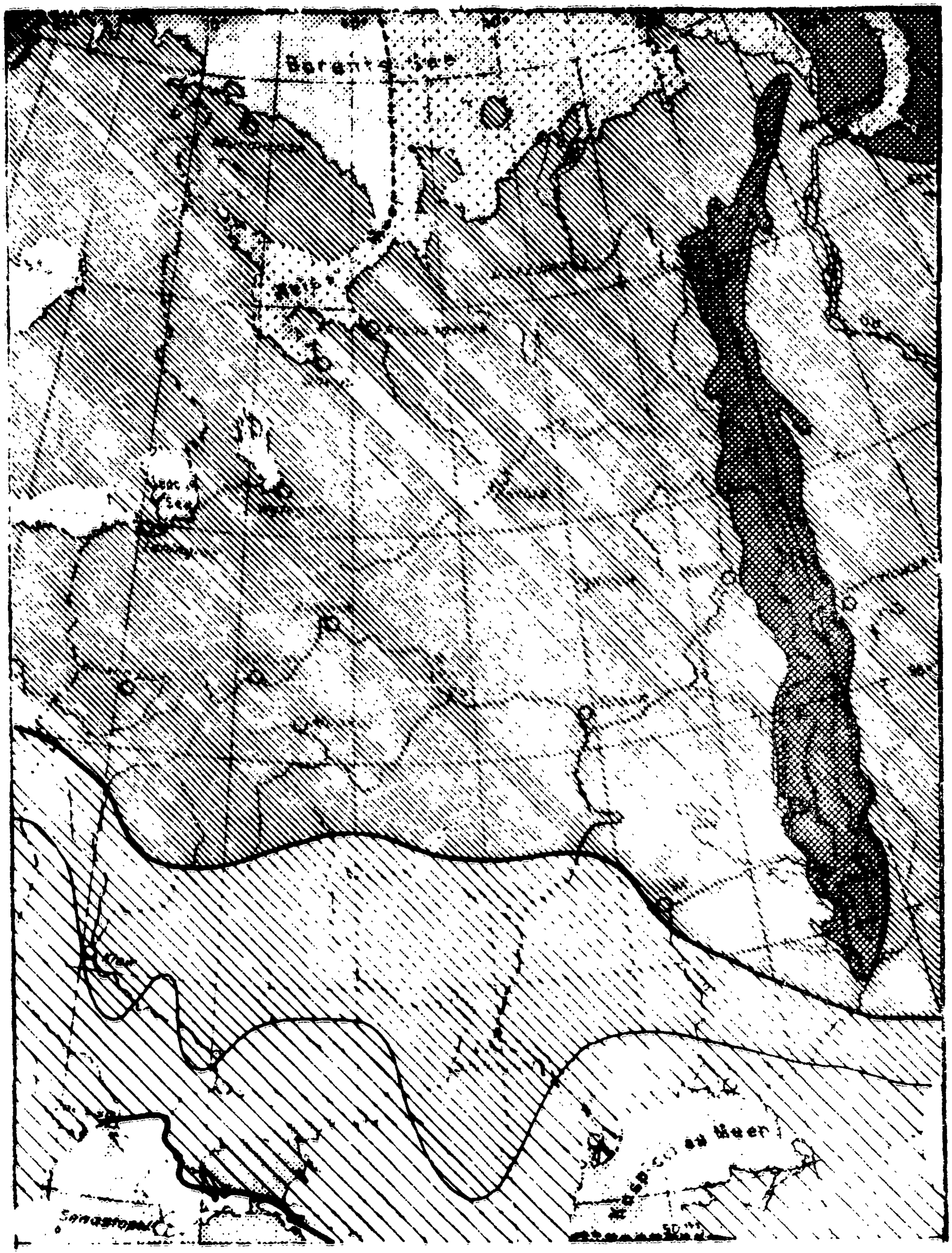
Map 5. Isolines of equal snow depth on 10 November



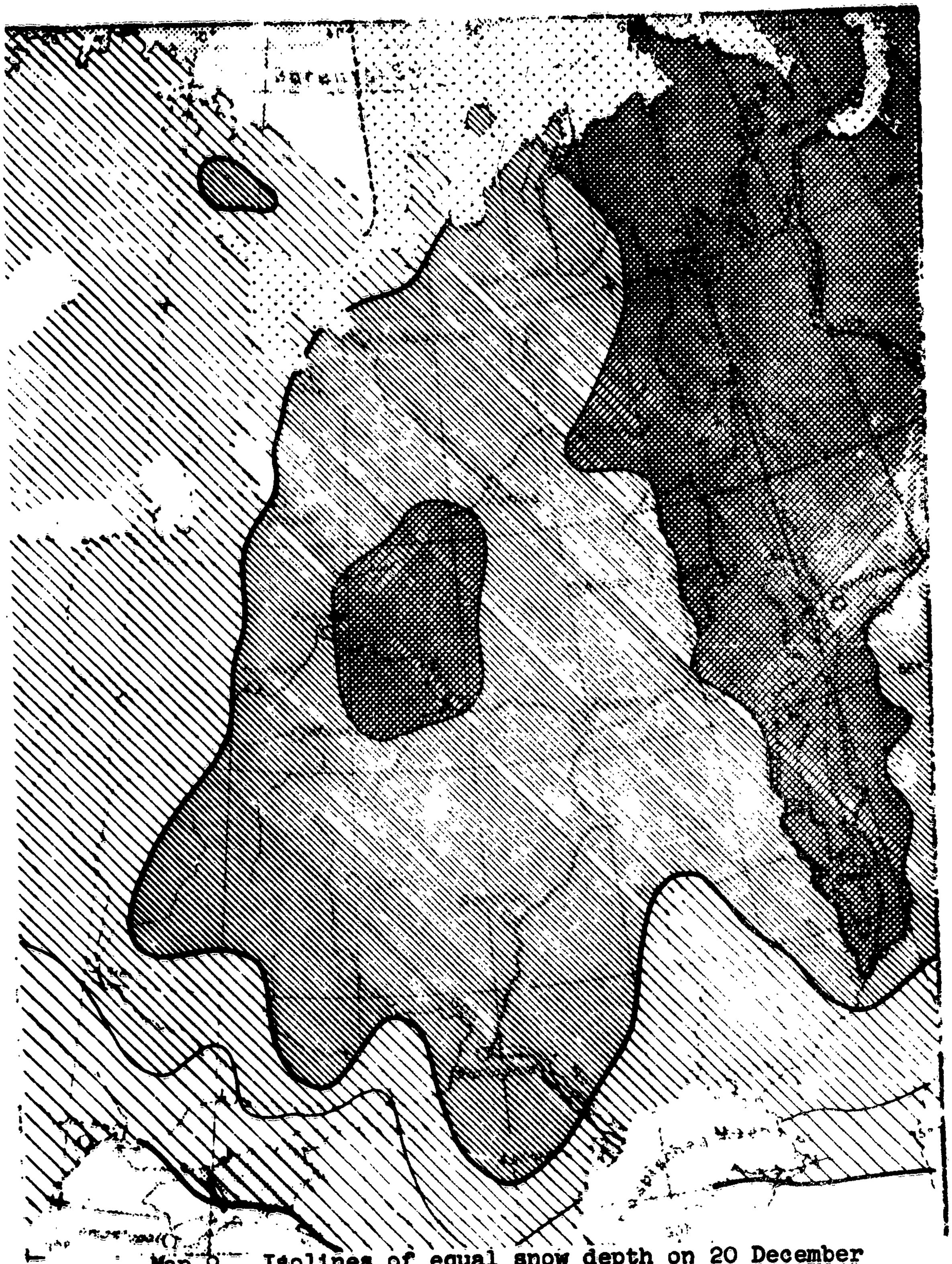
Map 6. Isolines of equal snow depth on 20 November



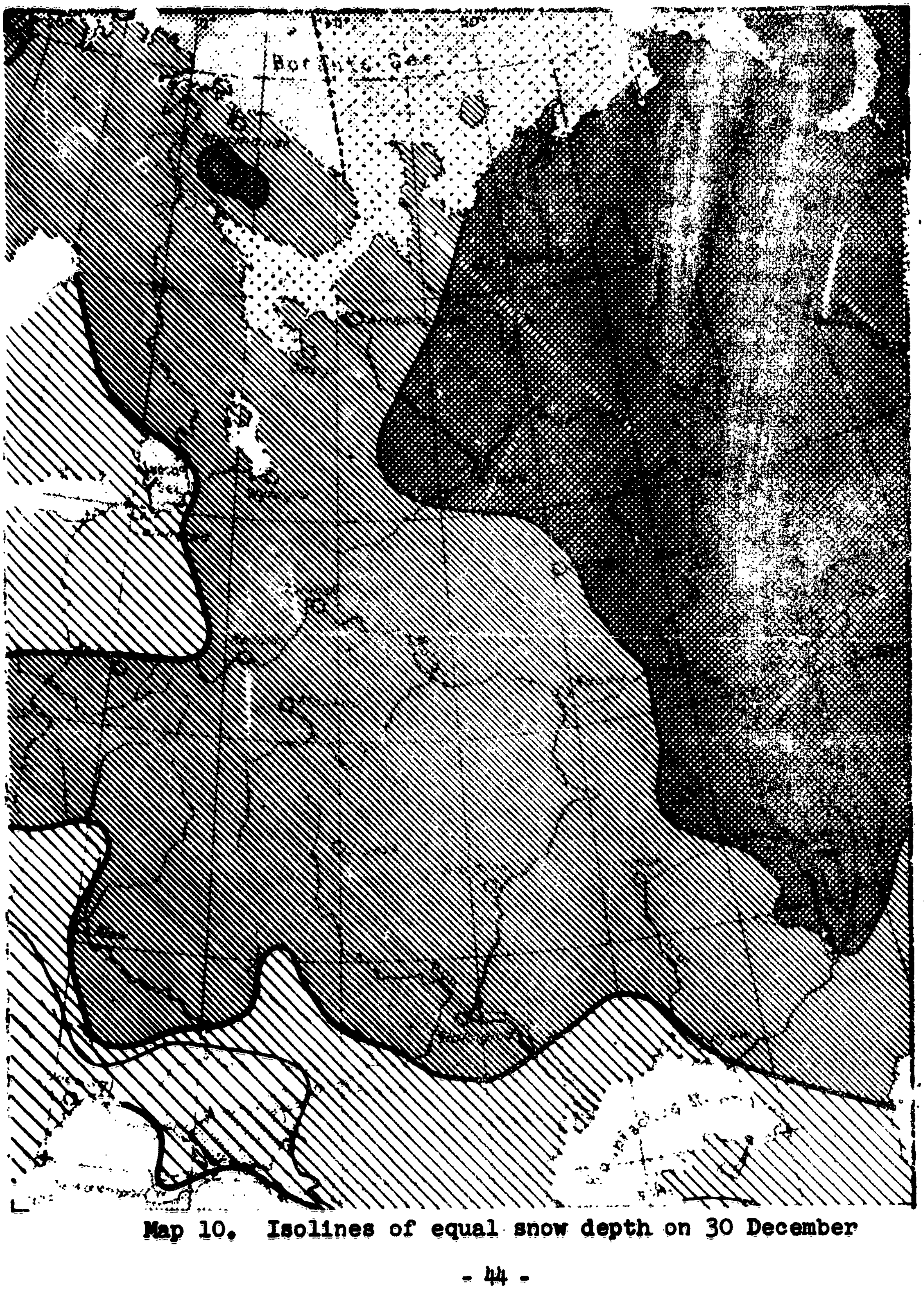
Map 7. Isolines of equal snow depth on 1 December



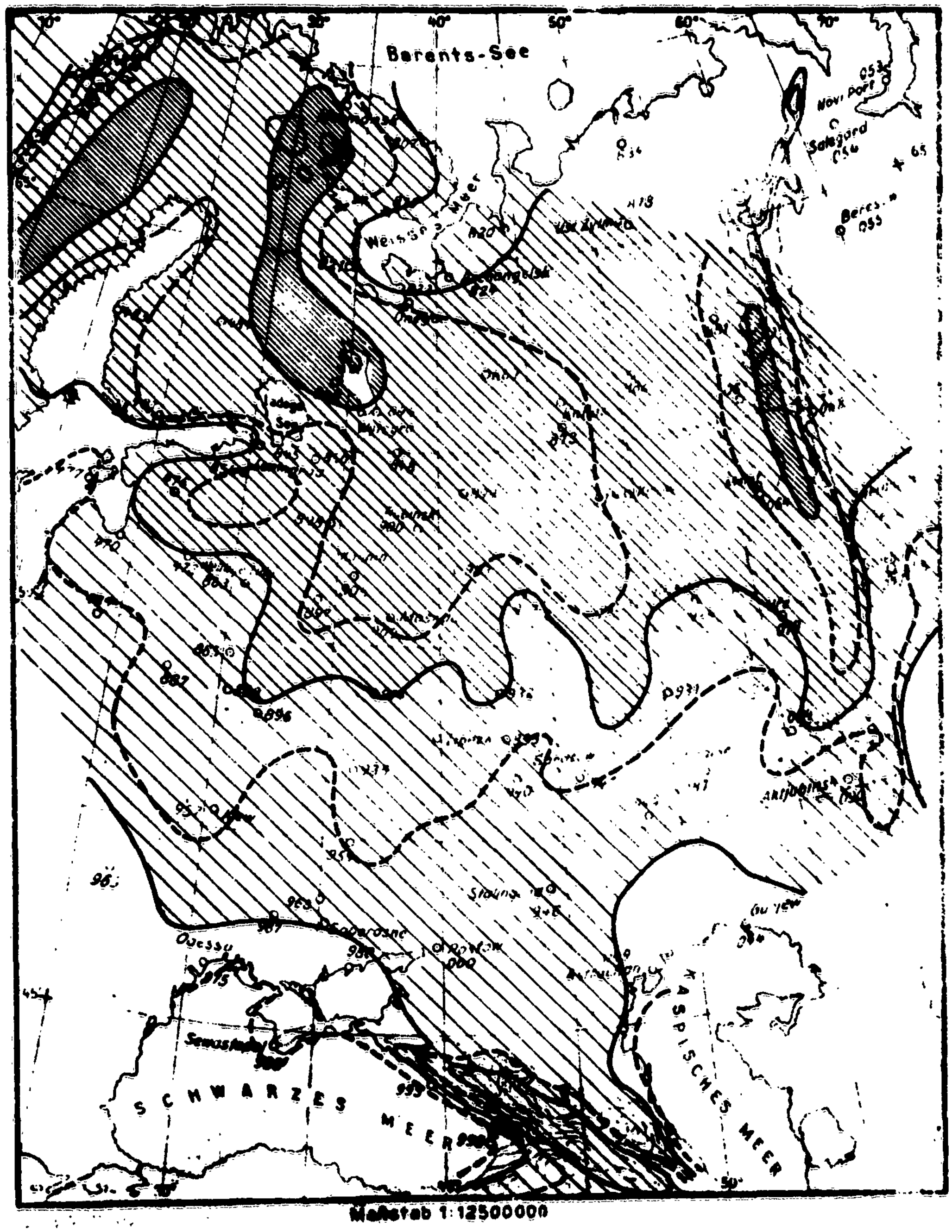
Map 8. Isolines of equal snow depth on 10 December

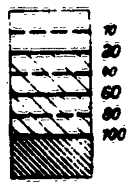


Map 9. Isolines of equal snow depth on 20 December

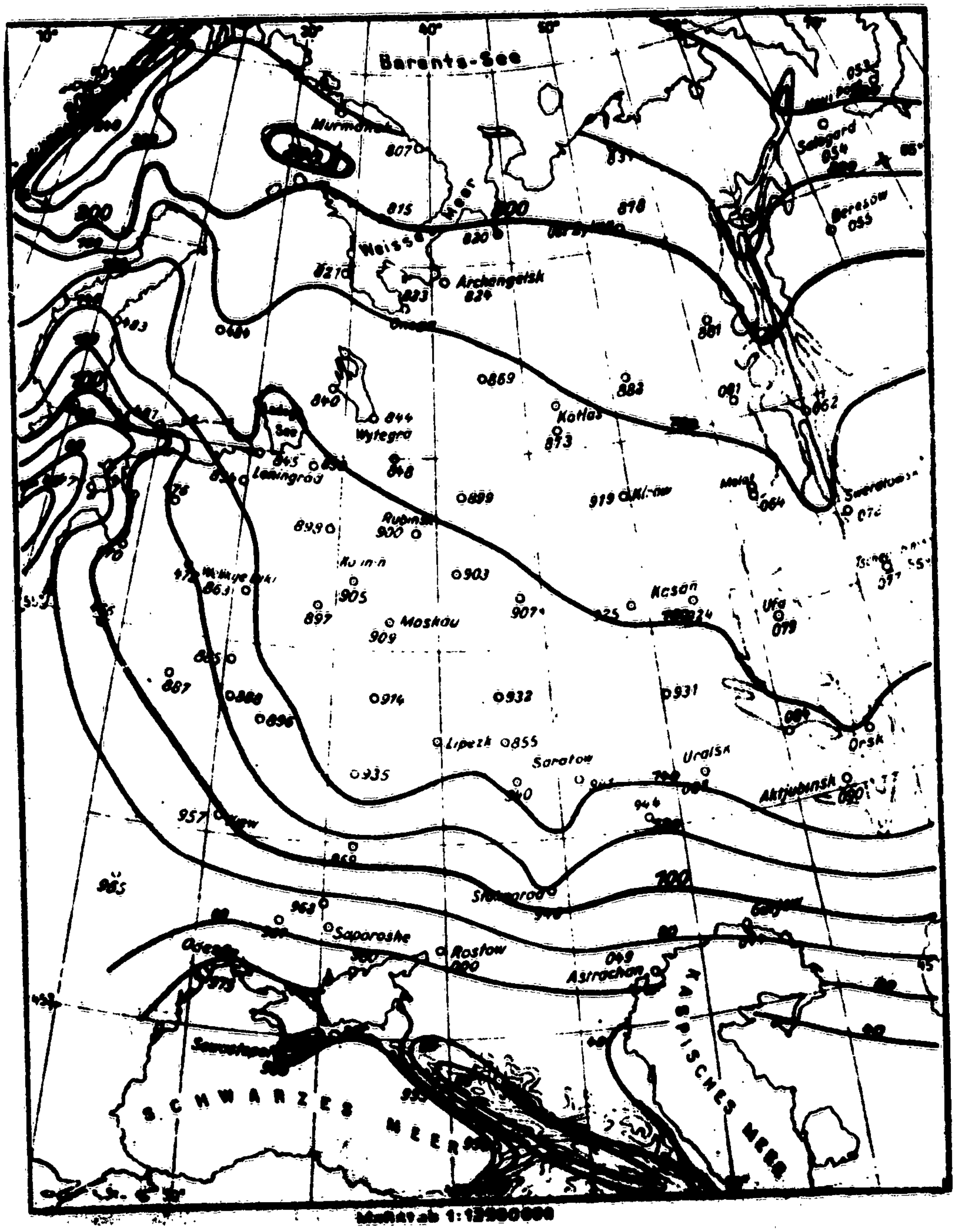


Map 10. Isolines of equal snow depth on 30 December

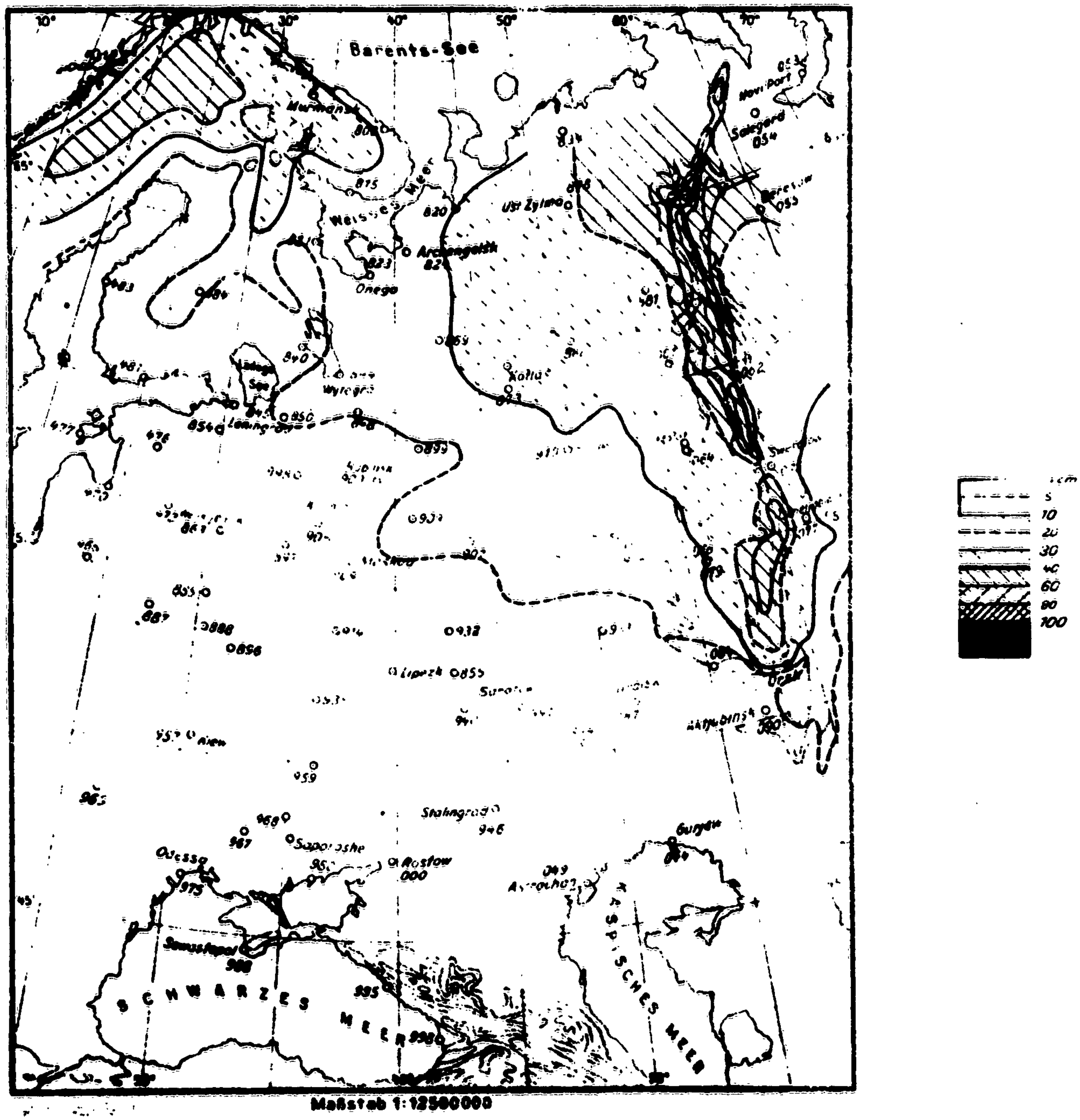




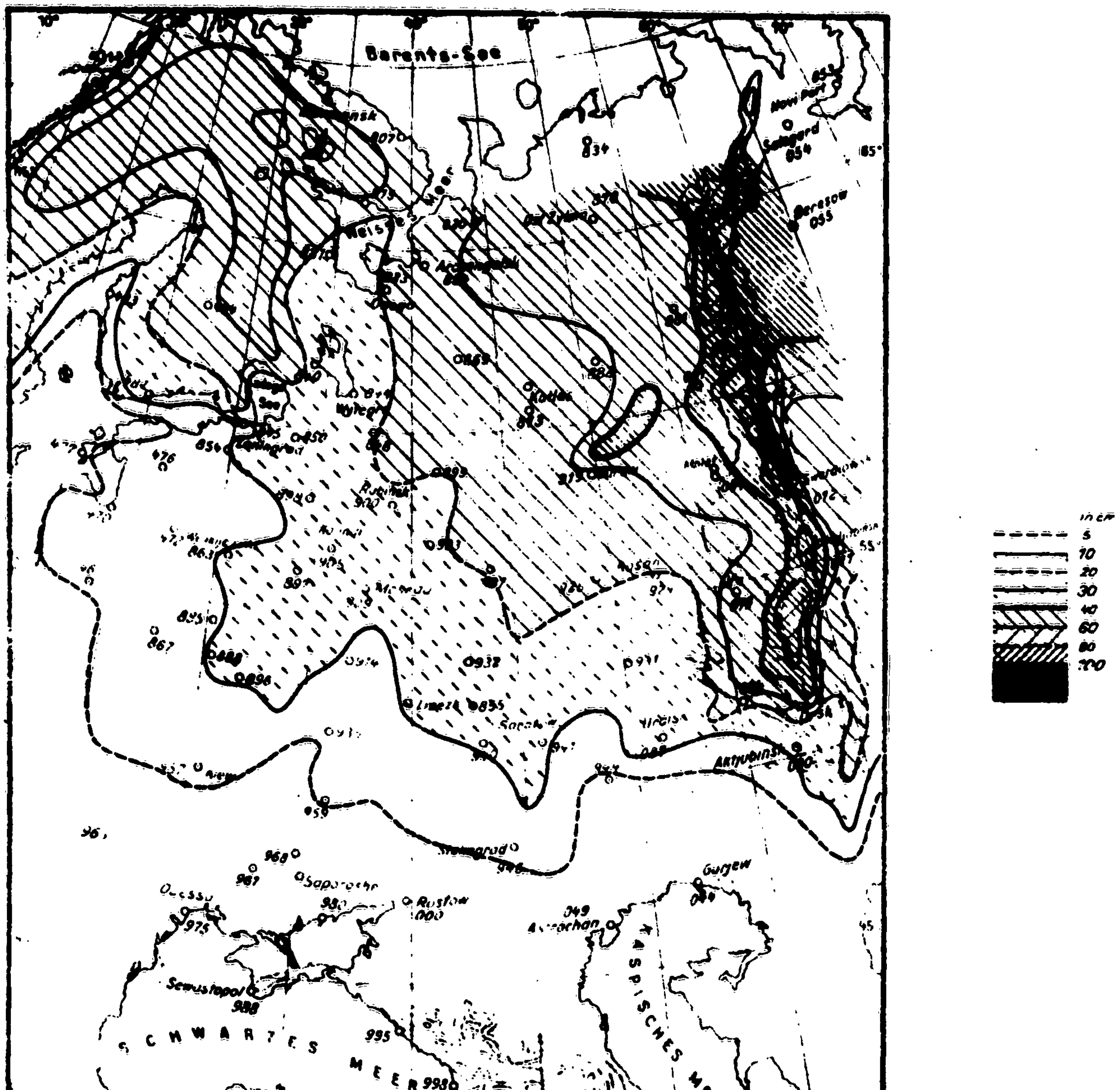
Map 11. Average number of days with snowfall annually



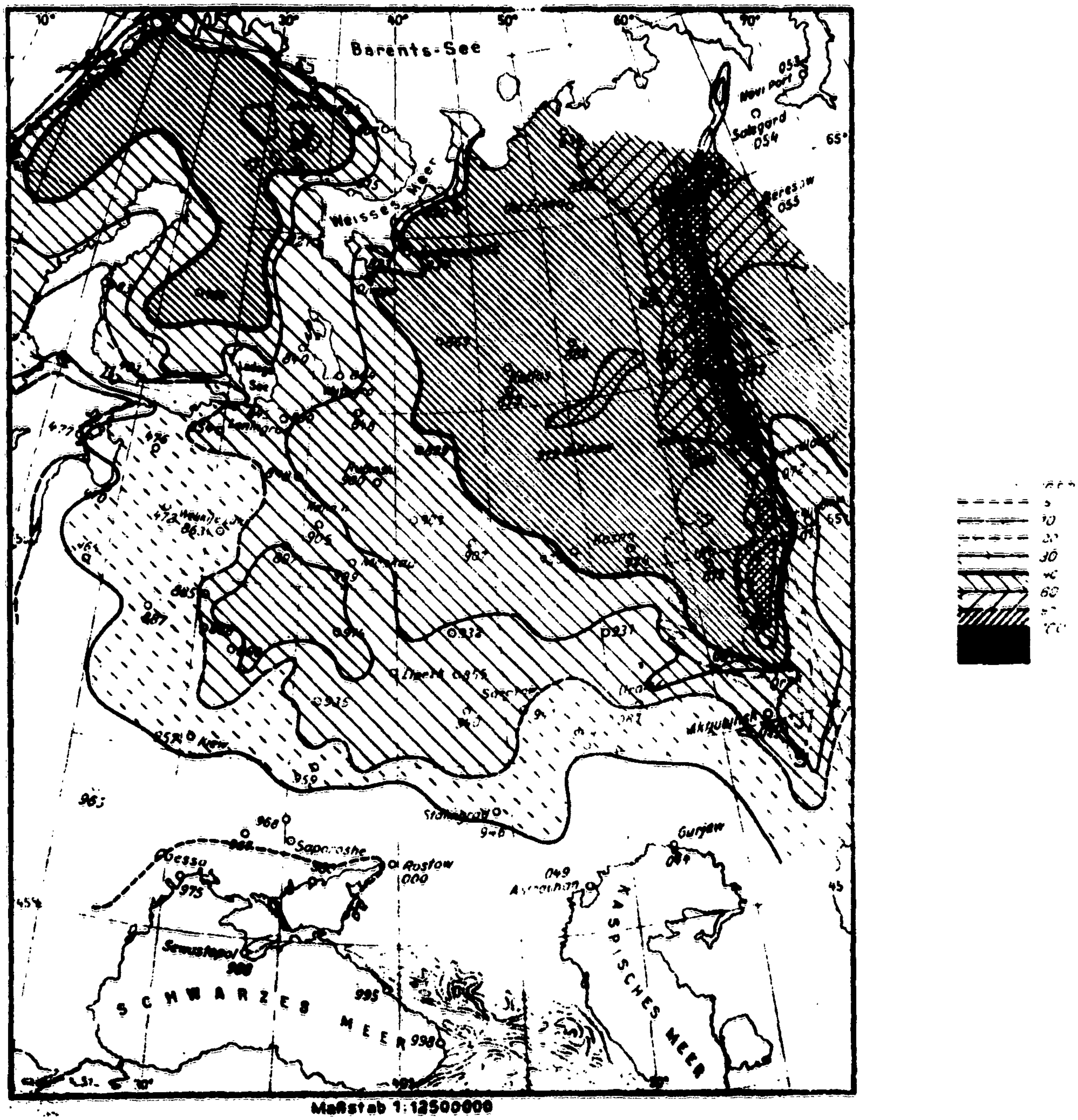
Map 12. Average number of days with snow cover annually



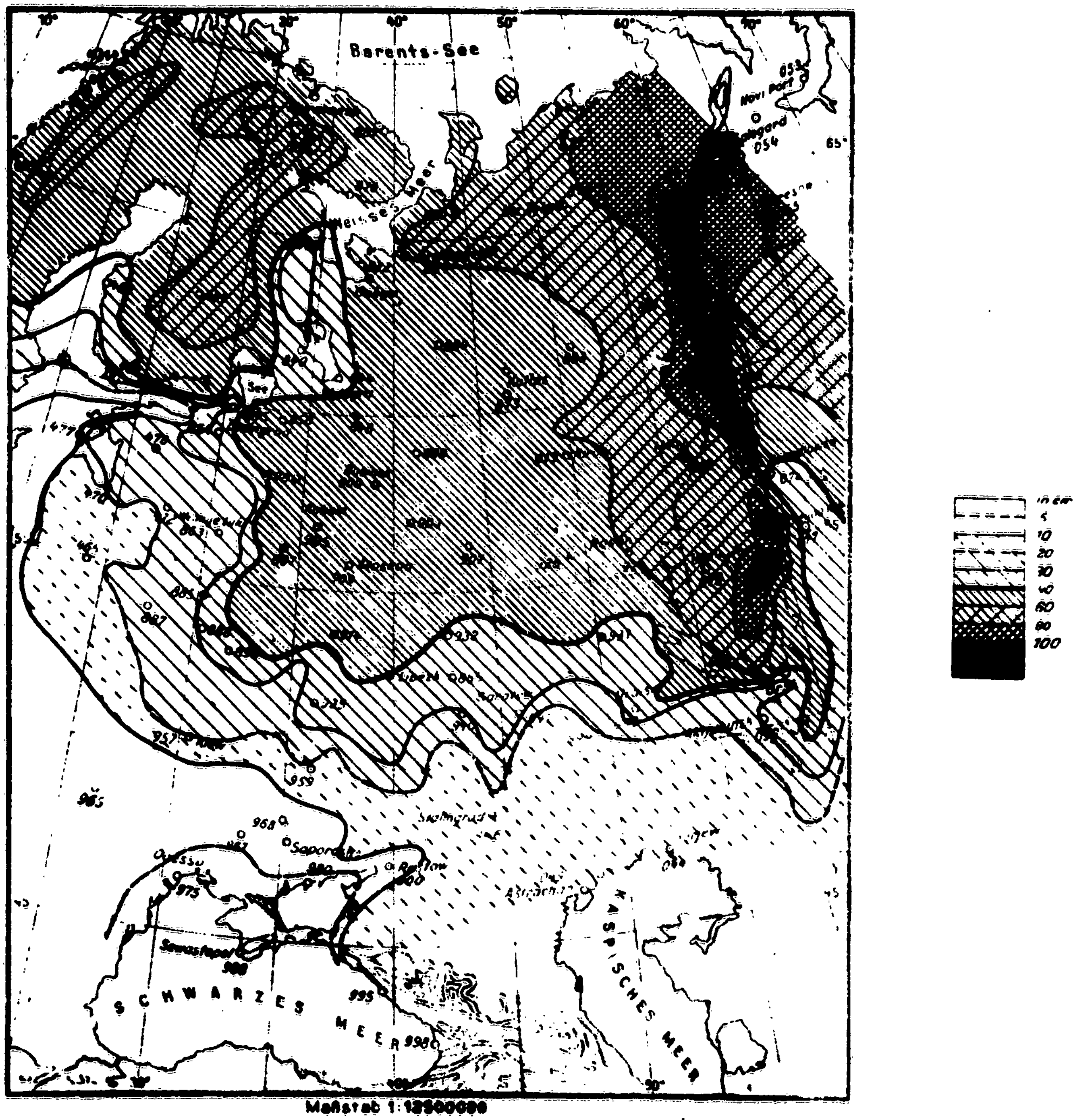
Map 13. Average depth of snow cover, 11-20 November



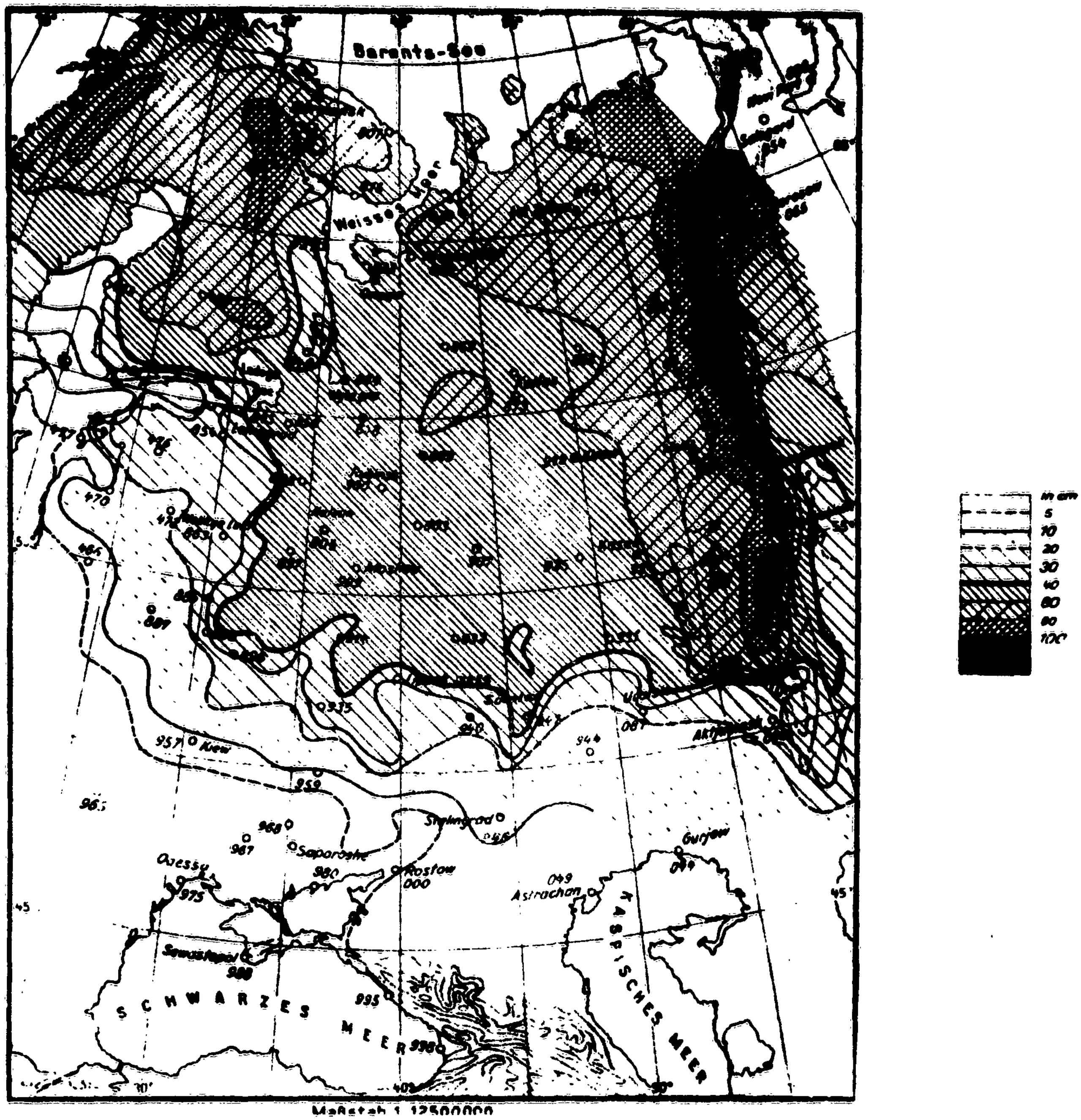
Map 14. Average depth of snow cover, 11-20 December



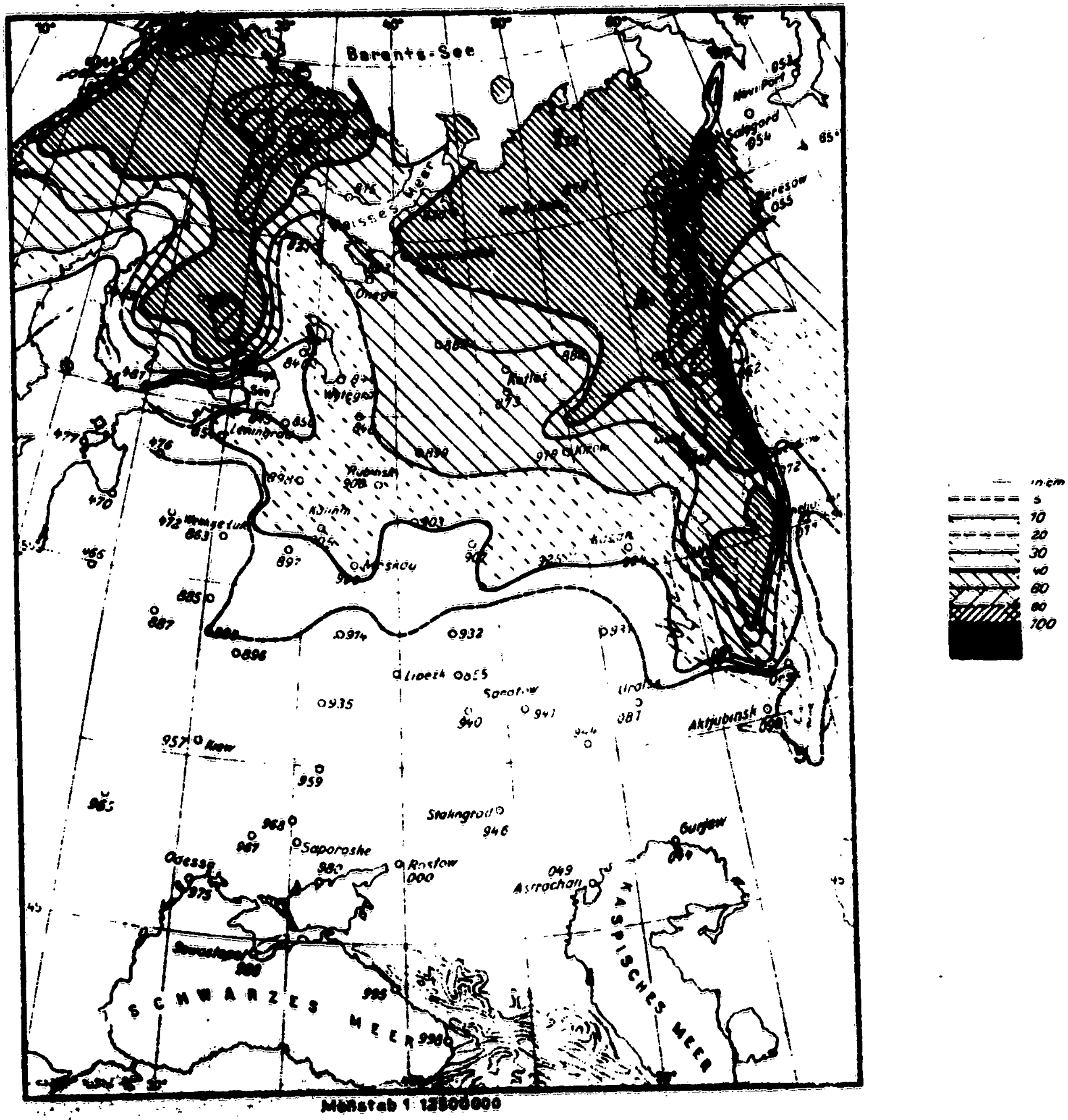
Map 15. Average depth of snow cover, 11-20 January



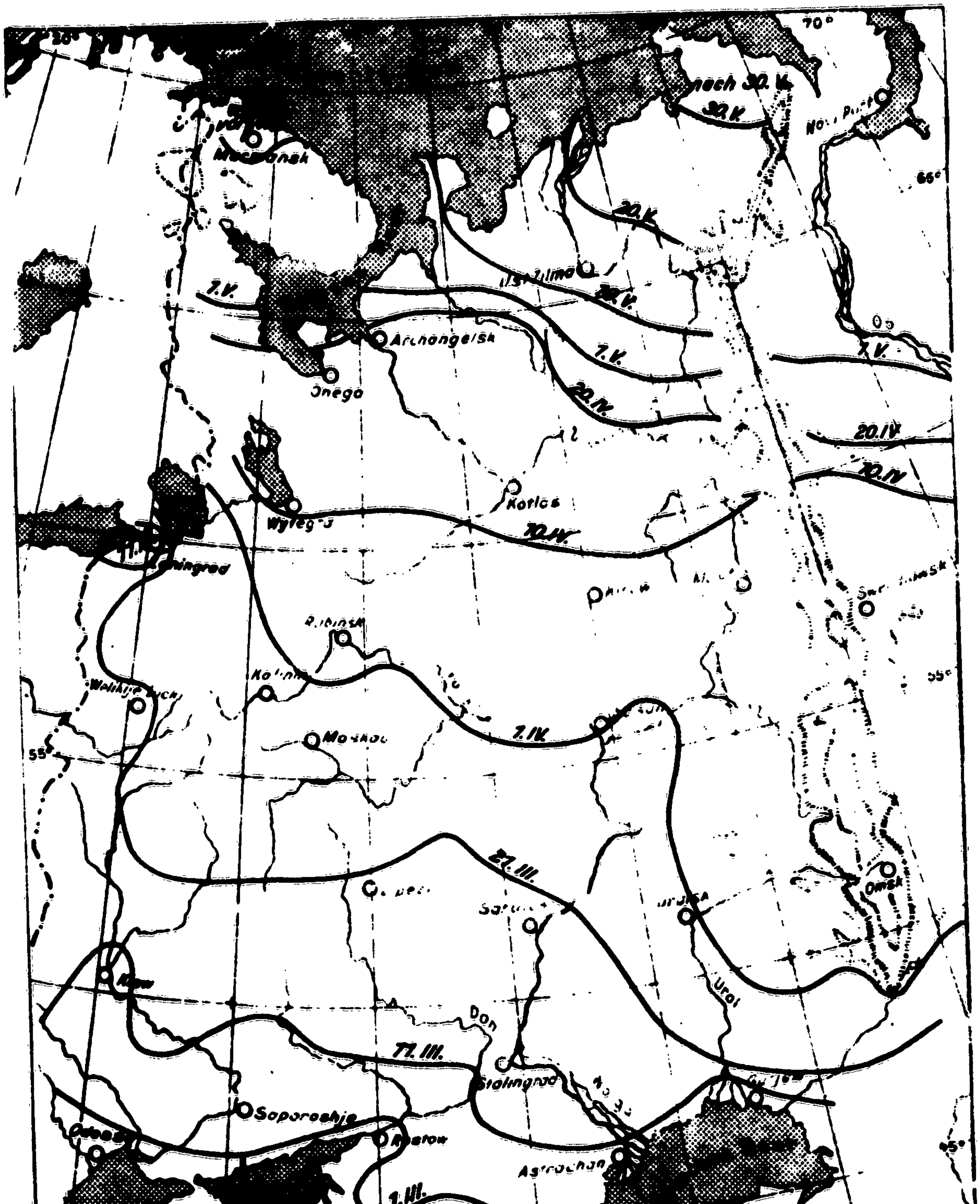
Map 16. Average depth of snow cover, 11-20 February



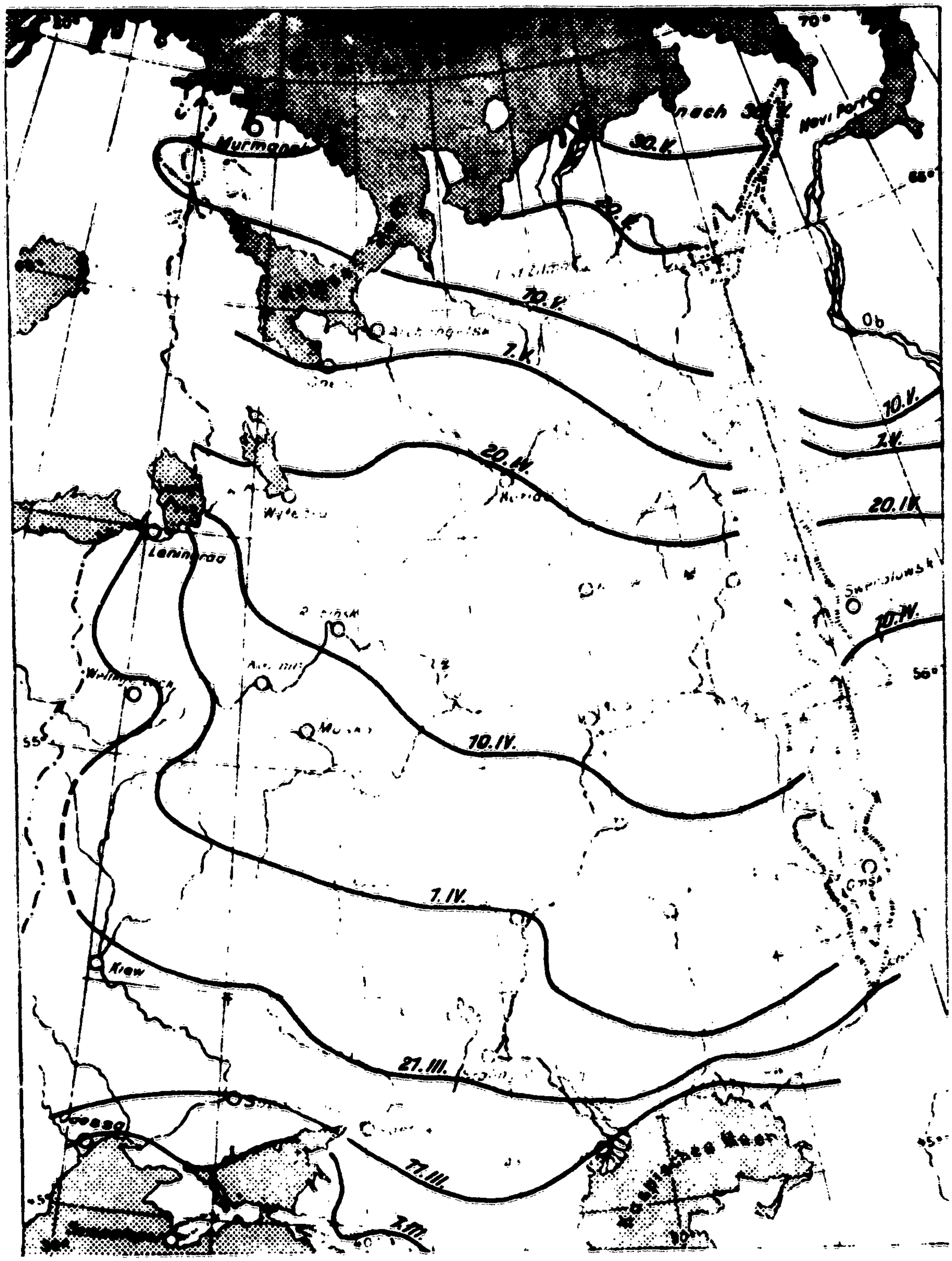
Map 17. Average depth of snow cover, 11-20 March



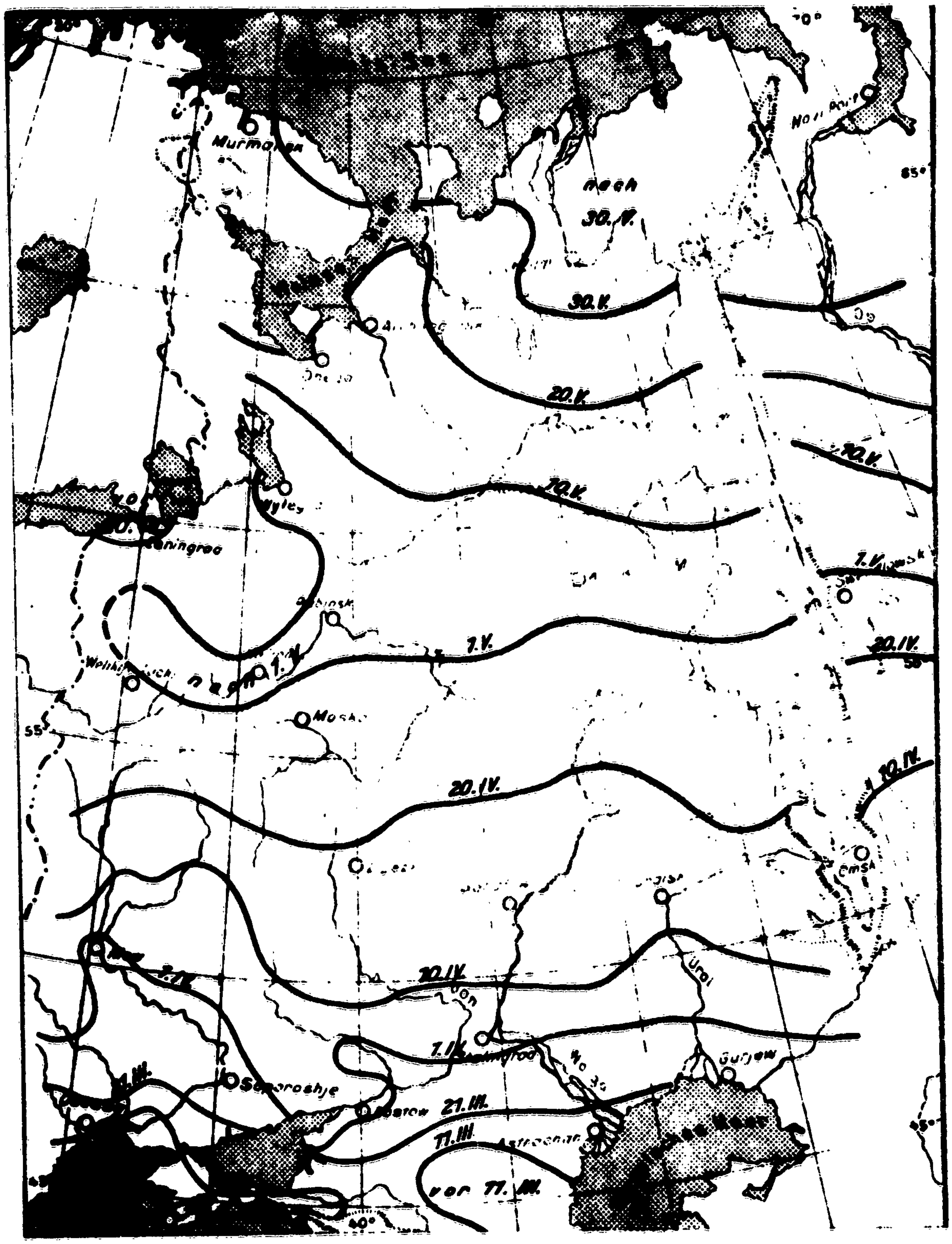
Map 18. Average depth of snow cover, 11-[illegible]



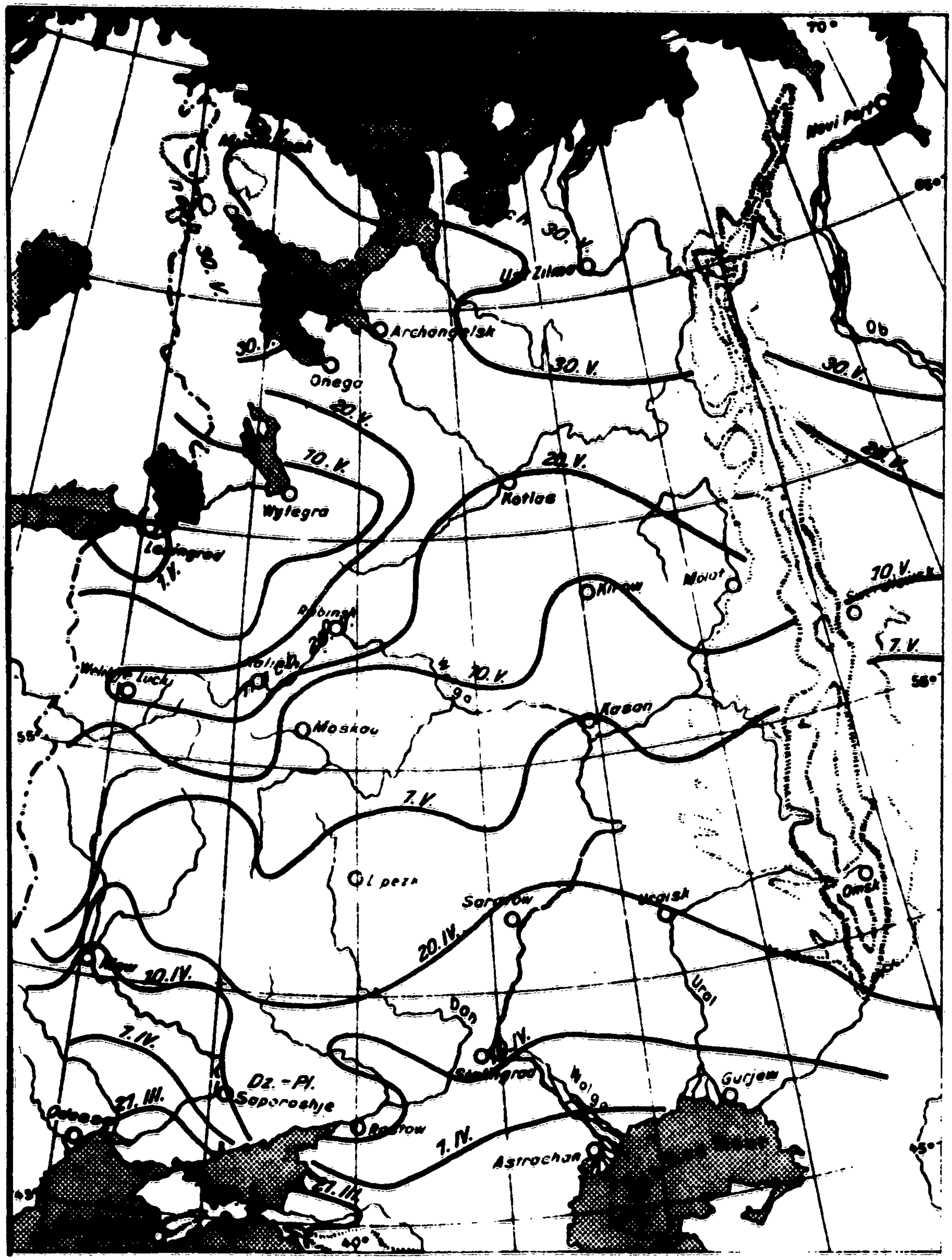
Map 19. Isochrones for onset of initial thaw



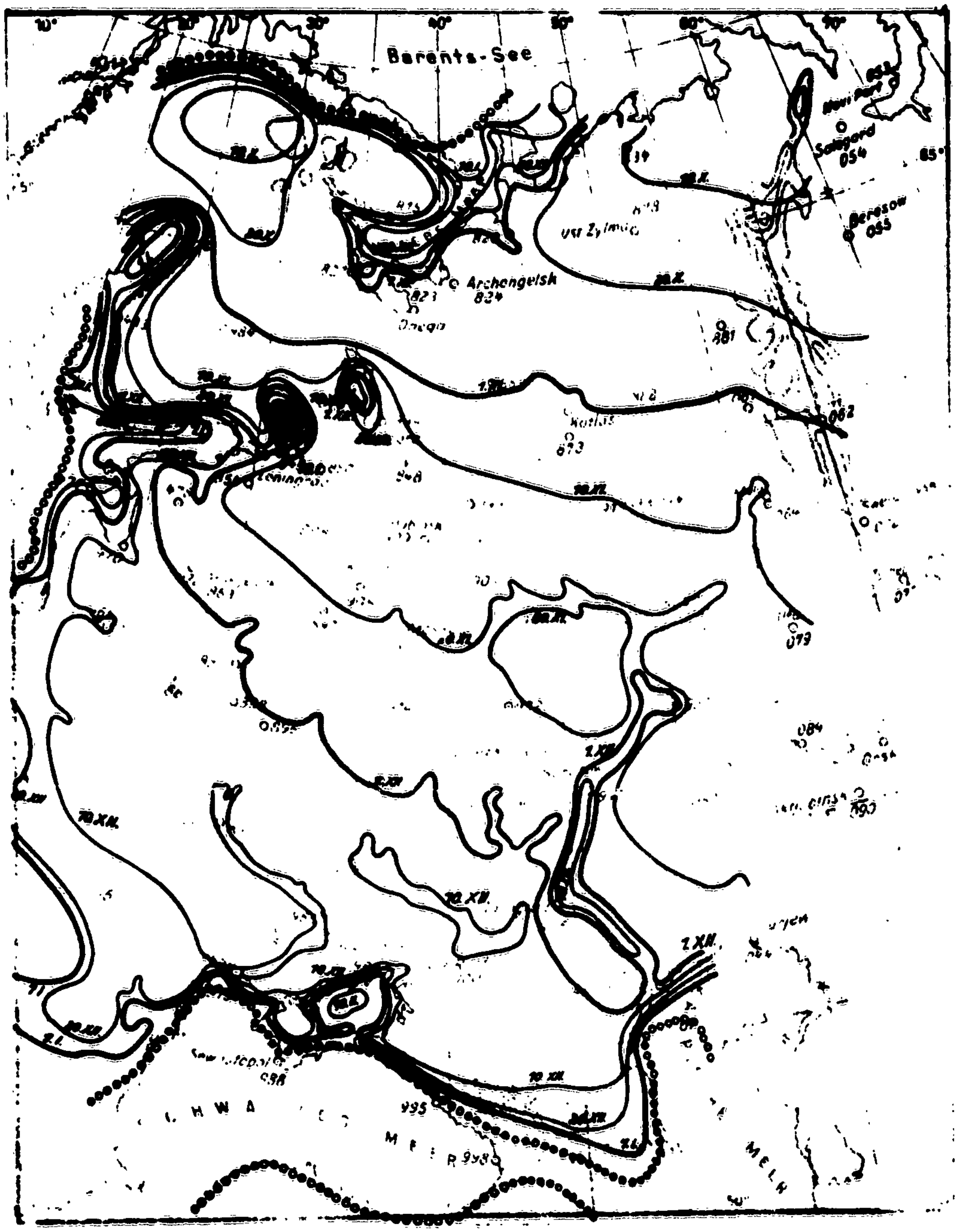
Map 20. Isochrones for commencement of extended snow melting



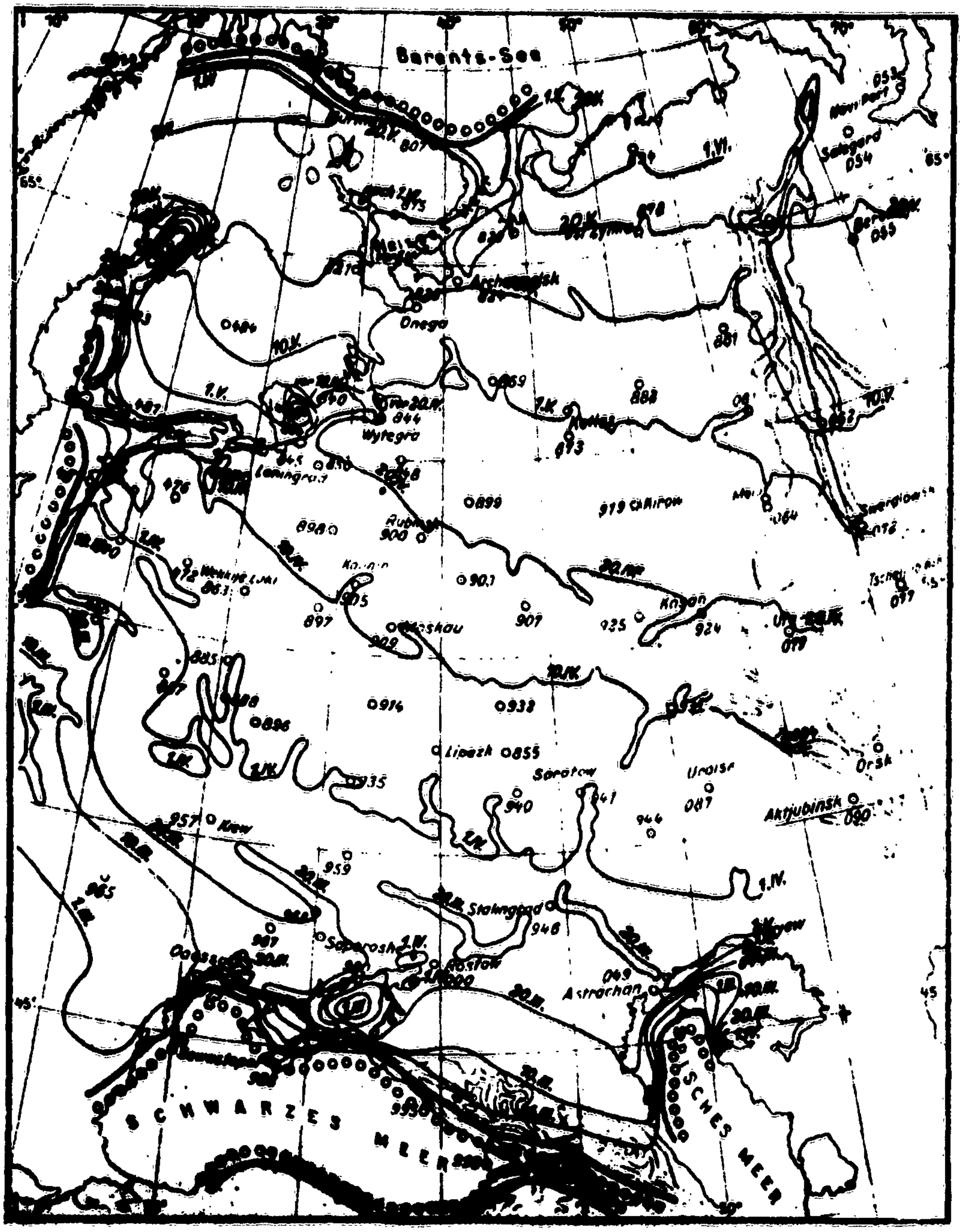
Map 21. Isochrones for hardening of the ground



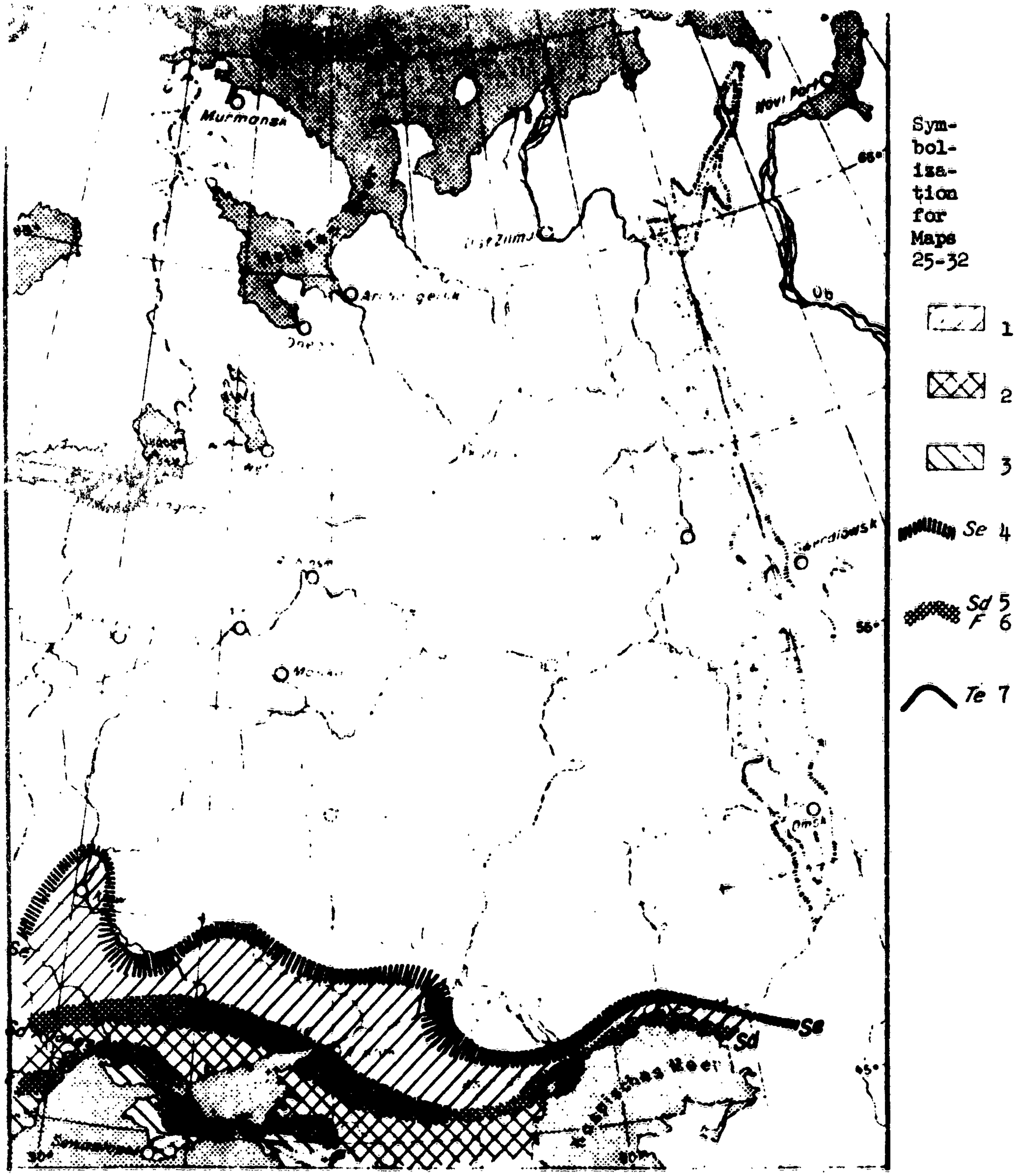
Map 22. Isochrones for initial drying of the ground



Map 23. Freezing dates for East European waters
oooooooo average southmost limit of ice

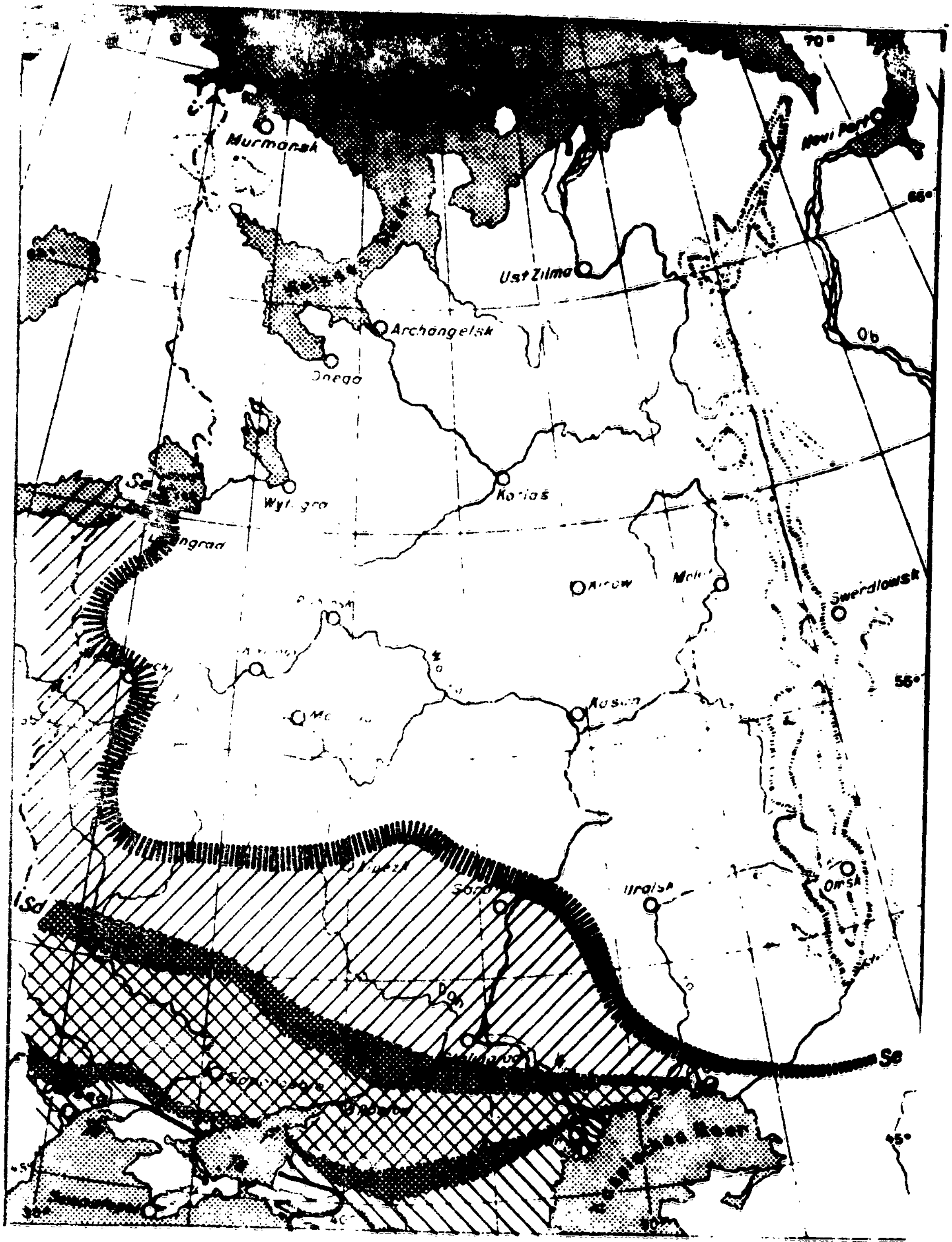


Map 24. Ice breakup dates for East European waters
OOOOOOOO average southermost limit of ice

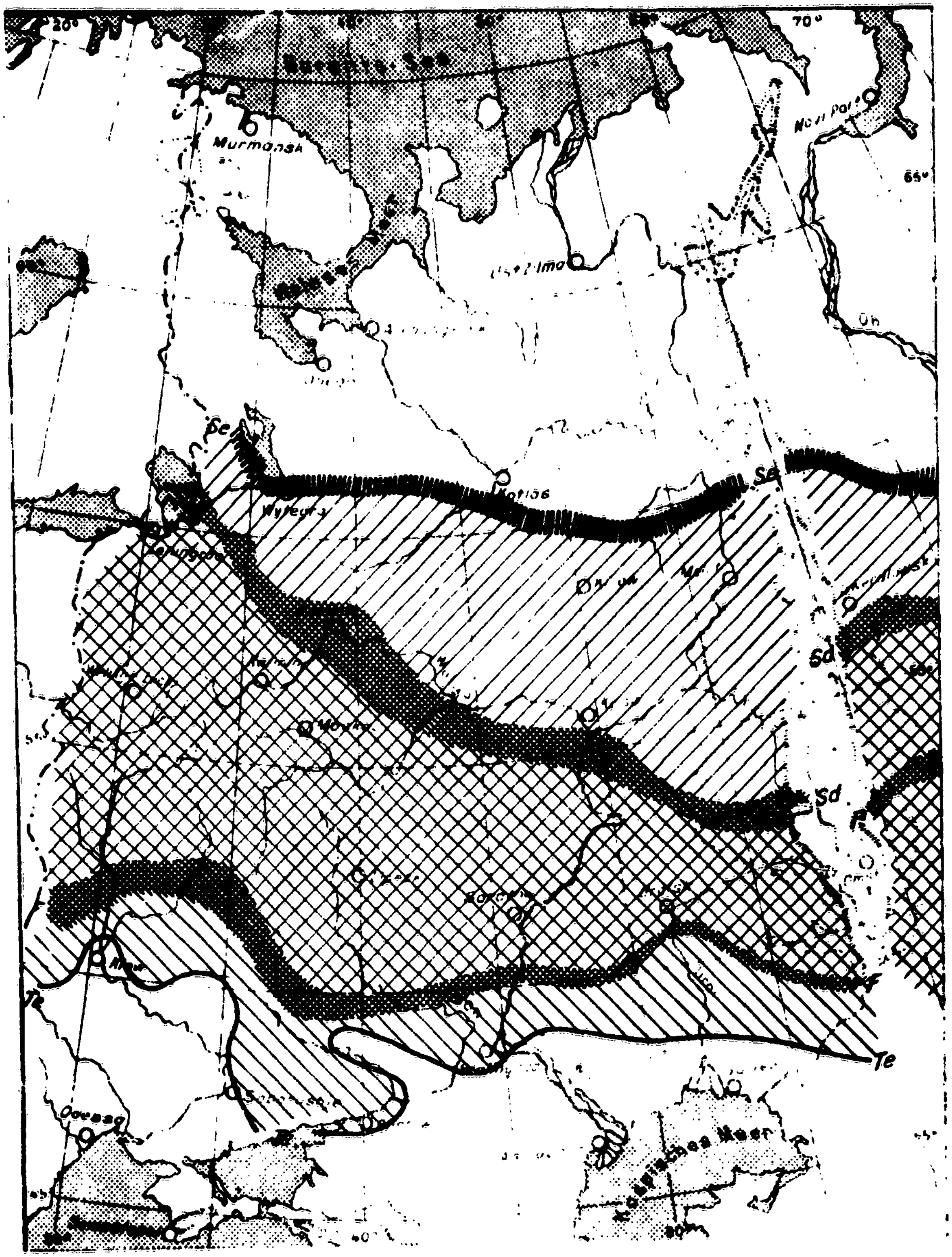


Map 25. Areas of thawed ground on 11 March

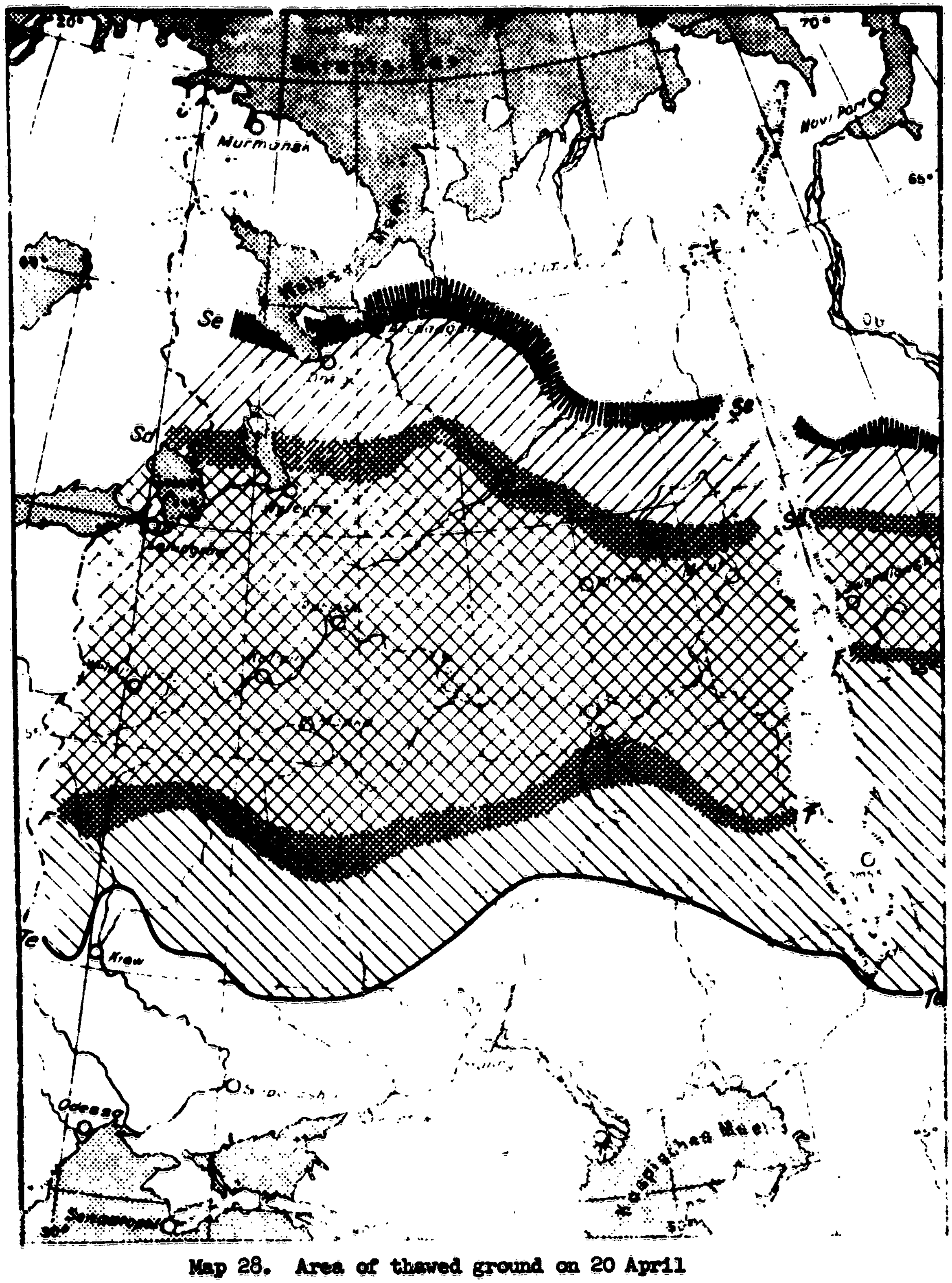
1 - alternate thawing and freezing; 2 - waterlogged thawed slush; 3 - ground still wet but hard; 4 - first thaw; 5 - extended [redacted] melting; 6 - hardening of ground; 7 - initial ground drying.



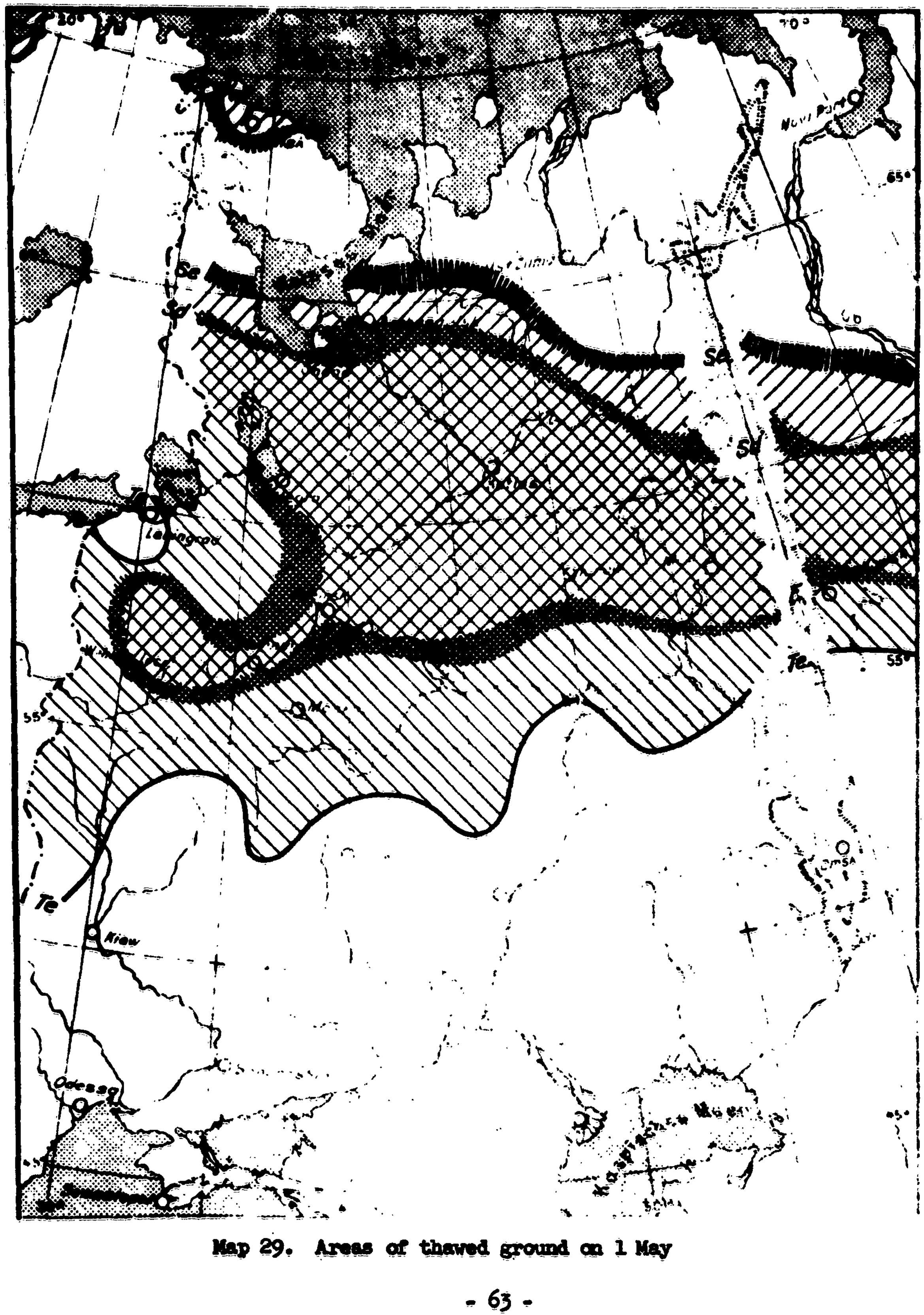
Map 26. Areas of thawed ground on 21 March



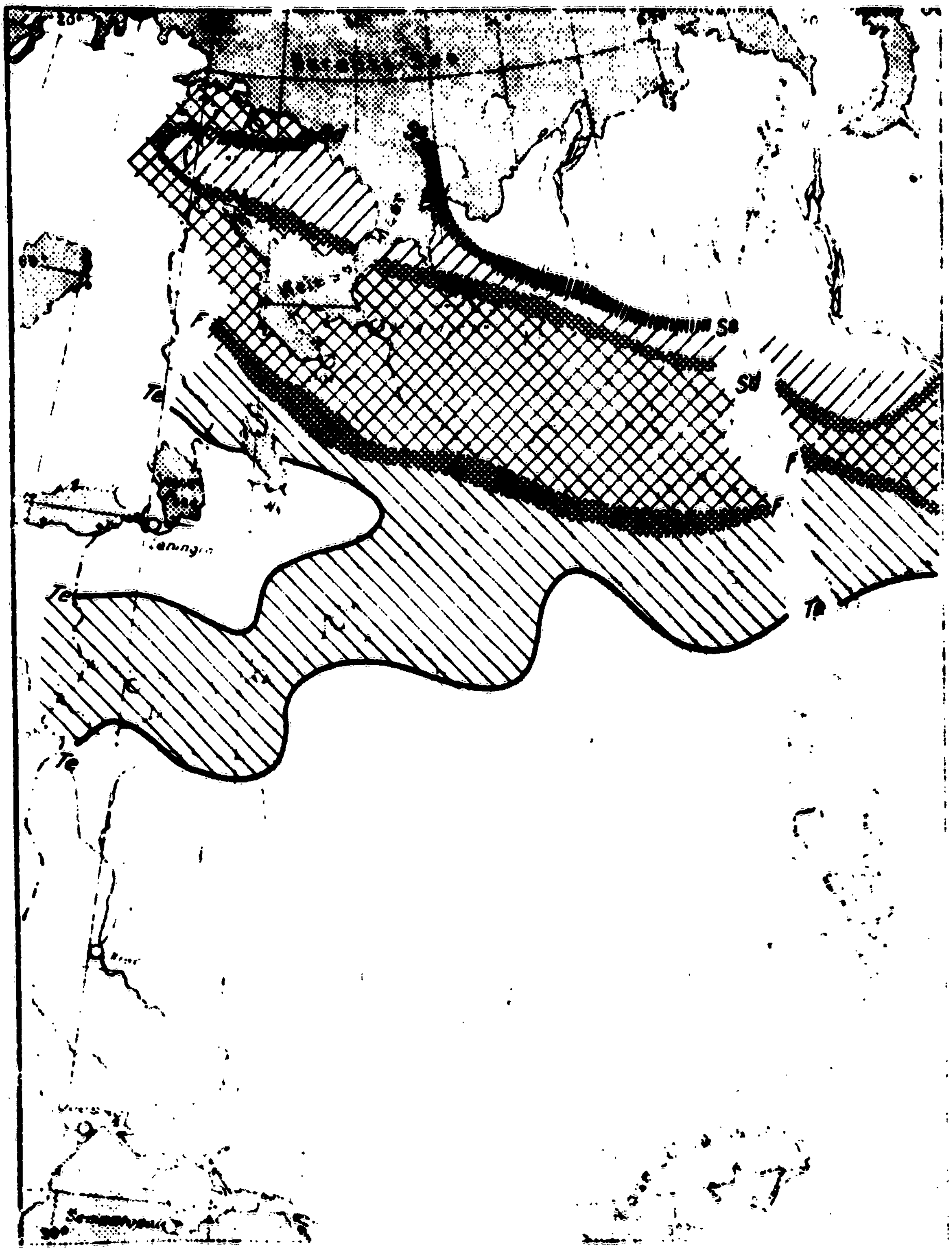
Map 27. Areas of thawed ground on 10 April



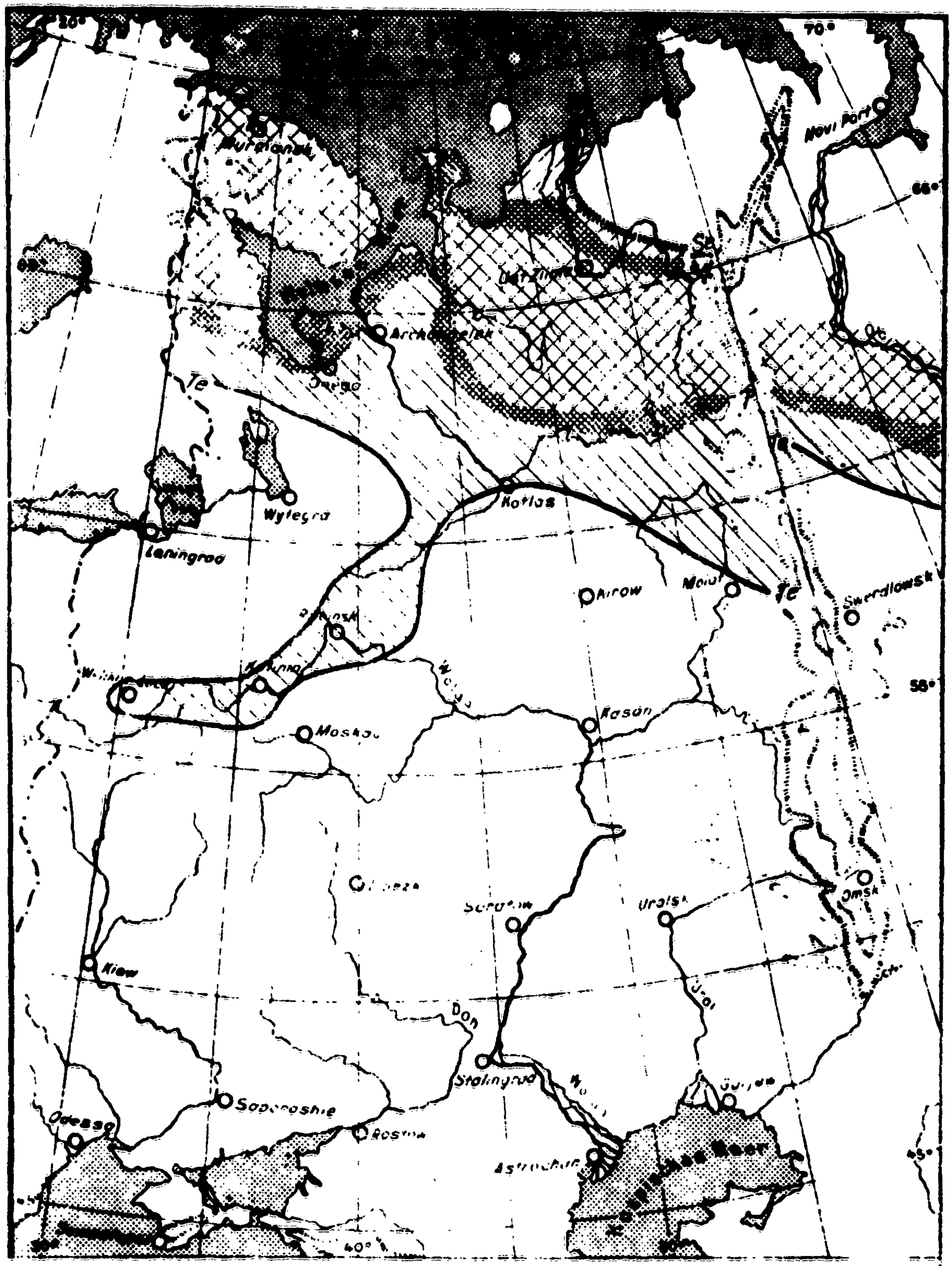
Map 28. Area of thawed ground on 20 April



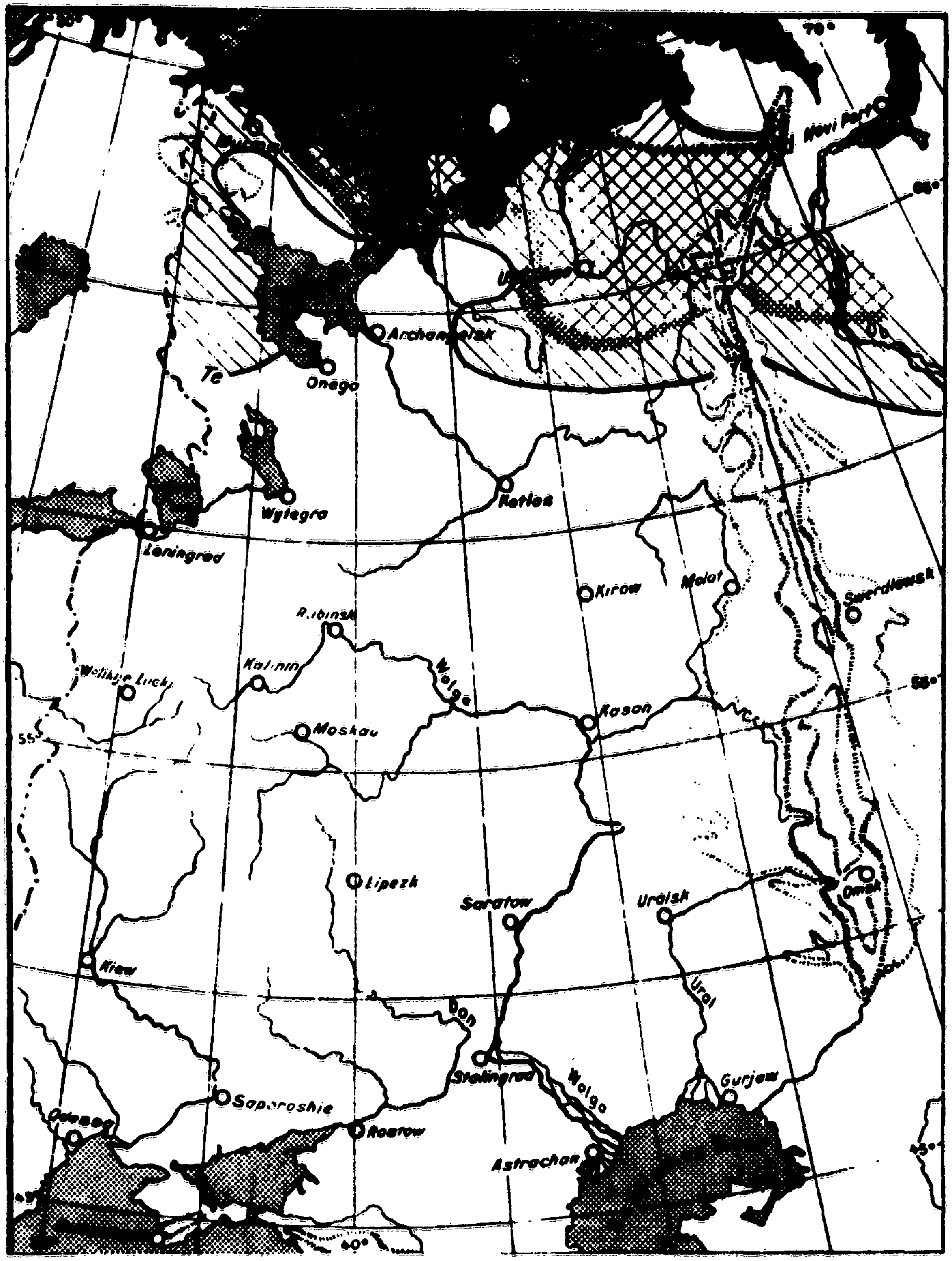
Map 29. Areas of thawed ground on 1 May



Map 30. Areas of thawed ground on 10 May



Map 31. Areas of thawed ground on 20 May



Map 32. Areas of thawed ground on 30 May

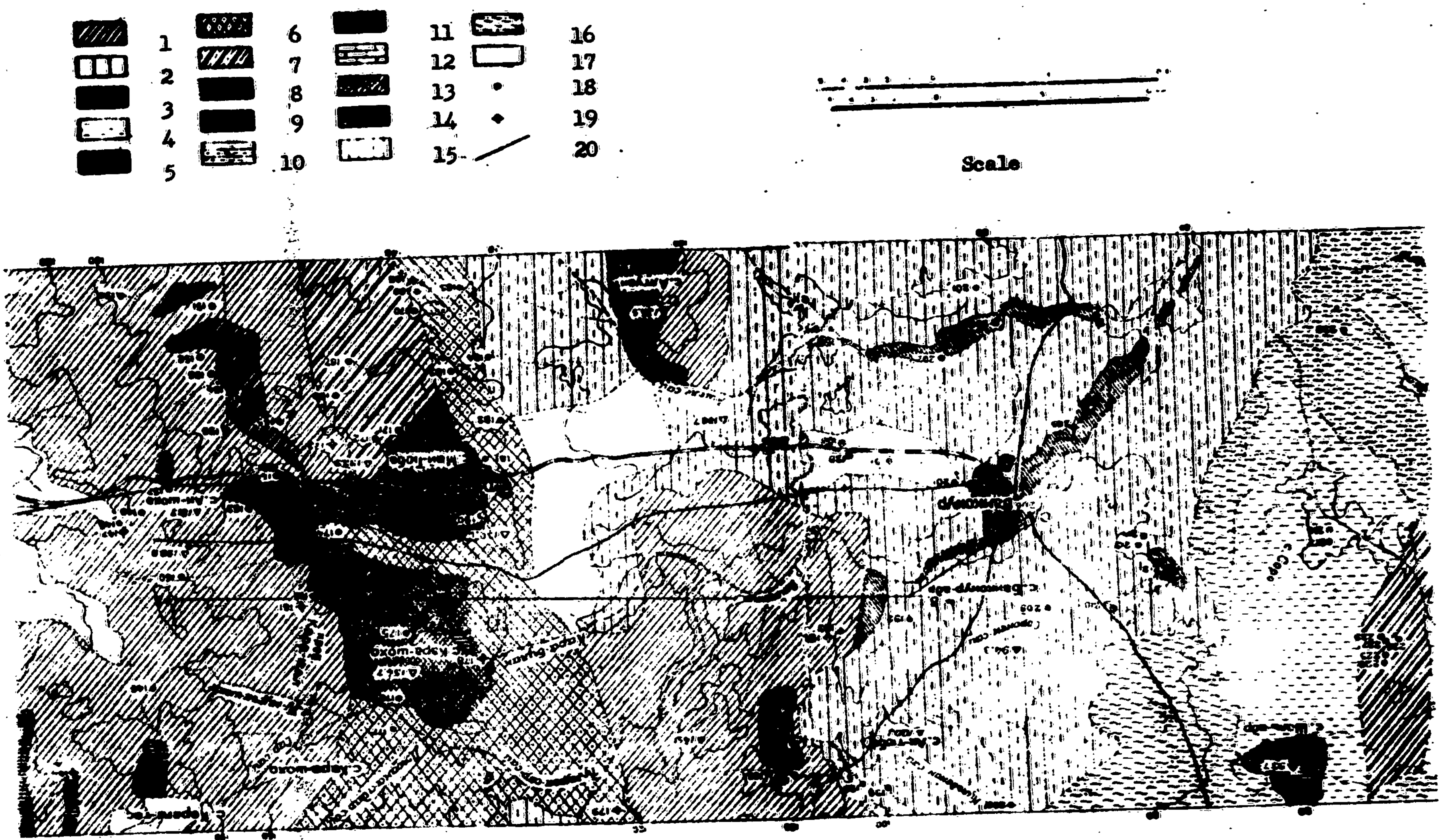
APPENDIX II. Maps

[To accompany Topic VII, General climatic data-- Kazakh SSR]

Map Index

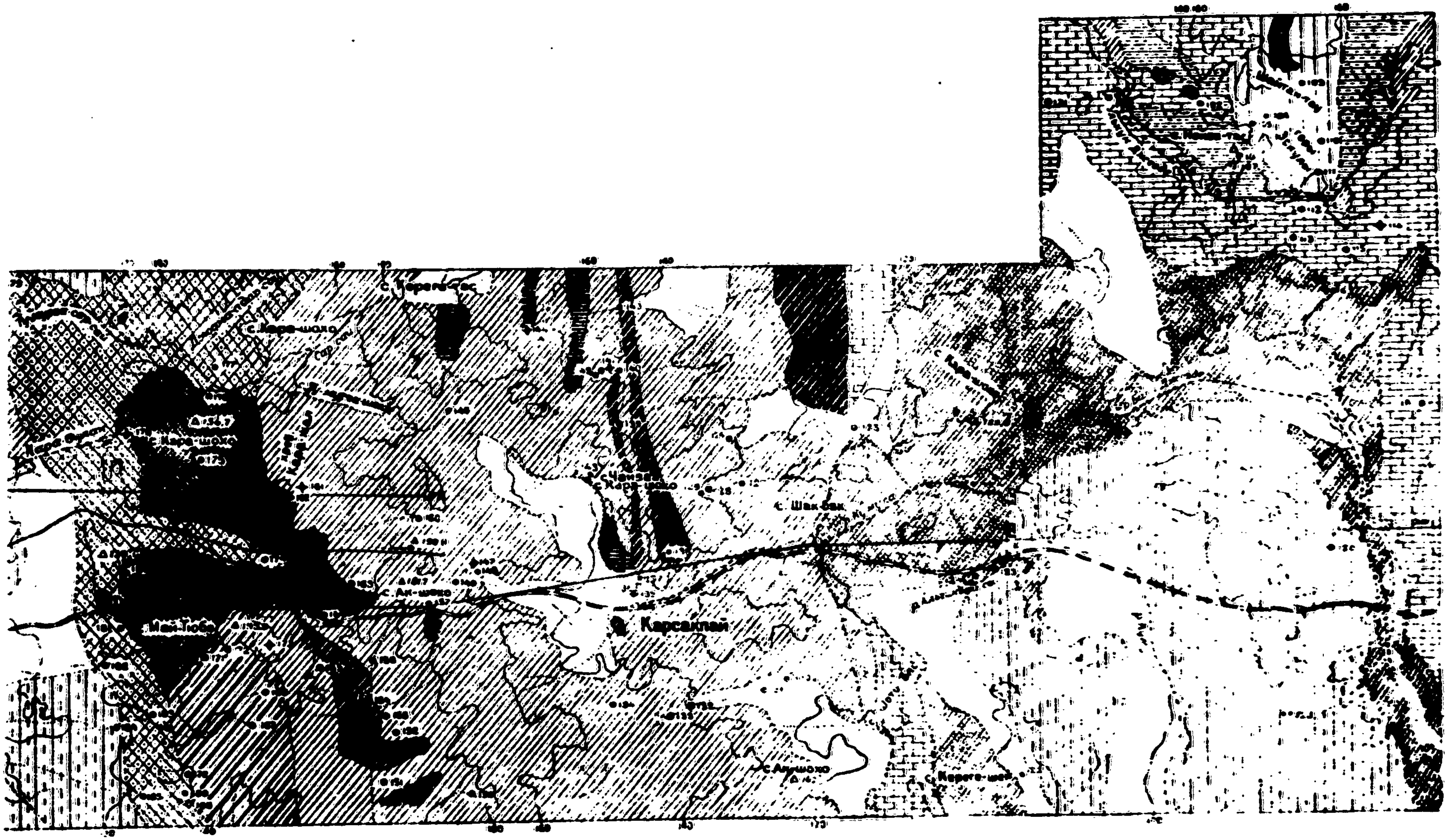
Zaytsev, I. K. Hydrogeological description of the Karsakpay--Baykonur region. IN: Vsesoyuznoye geologo-razvedochnoye ob"yedineniye NKTP SSSR. Trudy, no. 323, 1934, 50.

Grinev, V. Ya., I. Zaytsev, and I. Yagovkin. Hydrogeological map of the Karsakpay region. IN: Spravochnik po vodnym resursam SSSR. Tom 13: Severnyy Kazakstan (Handbook of water resources of the USSR. v. 13: Northern Kazakstan). Leningrad, Gosudarstvennyy gidrologicheskiy institut, 1933. 209 (ch. 3).

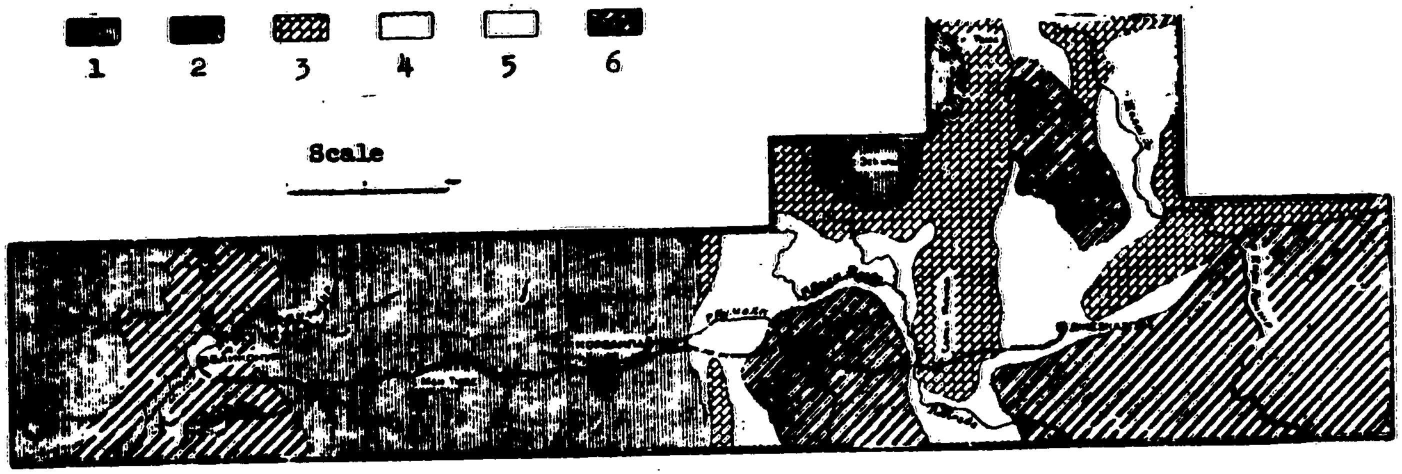


Map 1. Geological map of the Karsakpay--Baykonur region (continued on next page)

1 - crystalline schists (P_z); 2 - esculin strata (S_2); 3 - clayey schists (S_2); 4 - shaley sandstone strata (S); 5 - fine- and medium-grain granite (γ); 6 - gneisslike coarse-grain granite (γ); 7 - gabbro-diorites; 8 - porphyries and porphritics; 9 - gneisses; 10 - reddish layer (D^1_3); 11 - black marble-like limestones (D^1_3); 12 - limestones ($D^2_3C_1$); 13 - sandstones (Ca); 14 - Jurassic deposits; 15 - Tertiary deposits; 16 - post-Tertiary deposits (Q); 17 - Quaternary deposits; 18 - springs; 19 - wells; 20 - lines of geological cross-sections.



Map 1 (continued from preceding page). Geological map of the Karsakpay—Baykonur region



Map 2. Hydrogeological map of the Karsakpay region

1 - areas of predominance of fissure water (fresh); 2 - areas of sub-petroleum-layer fresh water aquifers in arkose conglomerates D_3^1; 3 - areas of sub-petroleum-layer and fissure waters and sub-petroleum-layer waters in limestones D_3^2 and limestone-sandstone strata C_1; 4 - sub-petroleum-layer waters (predominantly fresh) in sandstones C_2; 5 - sub-petroleum-layer waters (saline and bitter-saline) in Jurassic deposits around Baykonur; 6 - areas with developed Tertiary deposits (no near-surface water supply).